HEALTH ASPECTS OF PESTICIDES

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ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES PROGRAMS

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HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Division of Pesticide Community Studies of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 1150 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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ERRATUM

HAPAB 5(8), August 1972, p.369:

The citation as originally listed was incorrect. Correction is as follows:

72-1586. Entomological Society of Canada. (Author address not given). **Pesticides and the environment.** *Bull. Entomol. Soc. Can. 3(1): 1-16; 1971.*

72-2038. Dominick, D. D. (Environmental Protection Agency, Washington, DC 20460). **EPA and the pesticide problem.** *Ass. Food Drug Off. U. S. Quart. Bull. 36(2): 71-77; 1972.*

The programs and activities of the Environmental Protection Agency (EPA) are outlined in an address to the Association of Food and Drug (FDA) officials of the USA. The EPA shares authority for research on the effects of pesticides on fish and wildlife with the Department of the Interior. EPA's activities include the setting of standards that limit pesticide residues in food and assisting the FDA in the monitoring of compliance with these standards. A bill suggesting a new system of registration is being considered. According to this, pesticides would be registered under one of three categories: for "general use," for "restricted use," and "use by permit only." The bill also provides that experimental use permits can be issued prior to registration, an important control. Without it, certain pesticides would have to be removed from use altogether. Experts provided for consultation among the farmers are anticipated. Over a long term period, the cost of pest control to the farmer and consumer may result in an economic gain.

72-2039. Fisher, F. E. (Bureau of Food and Drugs, Indiana State Board of Health, Indianapolis, IN). **A state health department official views the new EPA and its proposed pesticide legislation.** *Ass. Food Drug Off. U. S. Quart. Bull. 36(2): 78-80; 1972.*

In reference to legislation regarding the control of pesticide use, the State of Indiana has passed an act which provides for three classes of pesticides: one for general use; one for restricted use; and one for use by prescription only. Each product or device which is distributed, sold, or offered for sale within the state must be registered with the State Chemist, who administers the act. A five-step program was proposed for the education of the public in the need for pesticides, the agriculturalists in the necessary precautions required with these compounds, and the food processors in the necessity of control of pesticides. Regular inspection of farms, greenhouses, and orchards and the examination of agricultural products for residues are advocated.

72-2040. Porter, H. L. (Div. of Plant Industry, Ohio Dept. of Agr., Columbus, OH 43215). **A state department of agriculture official views the new EPA and its proposed pesticide legislation.** *Ass. Food Drug Off. U. S. Quart. Bull. 36(2): 81-85; 1972.*

The EPA proposed legislation governing the use of pesticides; many people feel research by competent scientists is needed. Most state officials concede that the Federal agency should have 'stop sale' authority, authority over certain package requirements, right of entry, and authorization to collect samples and to examine certain records. However, the states need to have control over the registration of their products. Otherwise, the incentive to test them is lost. The EPA has been asked to define the extent of its participation in the laboratory analyses for consumer protection and its control of registration in the case of products which are specific to the individual states.

72-2041. Hasslinger, M.-A. (Zoologisch-Parasitologisches Institut der Tieraerztlichen Fakultaet der Universitaet Muenchen, Munich, Germany). **Folgen der Insektizidanwendung unter Beruecksichtigung lebensmittelhygienischer Belange. [Consequences of pesticide use from the viewpoint of food hygiene.]** *Fleischwirtschaft 52(5): 591-594; 1972.* (62 references) (German)

Pesticides are essential, along with proper animal husbandry, for reducing the economic losses caused by ectoparasites in domestic animals. However, pesticides have two undesirable aspects: toxicity to treated animals and residues in the food products prepared from them. Instances of these two aspects are reviewed. Pesticide poisoning after ectoparasite treatment has occurred in numerous documented cases, resulting in both death from acute manifestations and reduced productibility from after effects. The chlorinated hydrocarbons are rarely administered topically or systemically to animals for control of parasites due to their prolonged excretion in milk and eggs and occurrence in meat and fat. Organophosphates are degraded rather rapidly within or outside of the animal body and rarely give rise to residue problems in eggs and milk. However, crufomate residues have been found in the subcutaneous fat of a steer up to 21 days after pour-on application. Whereas pesticide labels generally suggest only a single application rate, generally set high enough to deal with the least susceptible pest, a systematic policy of using the minimum quantity of pesticide required to eliminate the specific pest might aid in reducing residue and toxicity problems.

72-2042. Taylor, F. B. (Div. of Water Hyg., OWQ, Environ. Protect. Agency, Boston, MA). **Trace elements and compounds in waters.** *J. Amer. Water Works Ass. 63(11): 728-733; 1971.* (5 references)

The 1962 revision of drinking water standards contained two new concepts for chemical limits of water constituents: a general limit for organics called chloroform extracts and a limit as to the addition of chemicals (fluoride ion). The widespread presence of DDT and the finding of mercury in fish have alerted the public to contaminants. A table shows the number of water-supply systems and the number of distribution-system samples that exceeded the trace-element and compound limits of the 1962 standards. Another table lists the trace element or compound, the limit set for it (1962), a statement of the rationale behind the limit, and data on the occurrence of the chemical in U.S. public water supplies. A third table provides information on trace elements, herbicides, and insecticides for which no limit

was published in 1962, but for which limits have been unofficially adopted. It is argued that possible beneficial effects of trace elements must be taken into consideration in respect to drinking water.

72-2043. Heins, C. F. (Chem. Div., Denver Res. Inst., Univ. of Denver, Denver, CO). **What is the future of pesticides?** *J. Environ. Health 34(6): 597-602; 1972.* (12 references)

The policy regarding the use of pesticides and the formulation of effective legislation in this connection are discussed. An up-to-date evaluation of the control of pesticides must include an overall picture of the farmer's concern with the production of saleable products, the cost of pesticides, the growing insect resistance to the known toxins, and the effects that insecticides may have on desirable insects. The effects of pesticides on human health are also a great cause for concern. Exposure to parathion, for example, is known to constitute a hazard; however, not much is known about the exposure to low levels of persistent chemicals. Birth defects due to pesticides have been reported. Environmental pollution is another result of the use of pesticides. Suggestions as to future programs and incentives are delineated.

72-2044. Suzuki, T. (Agr. Chem. Insp. Sta., Tokyo, Japan). **Registration of agricultural chemicals in Japan.** *Jap. Pestic. Inform. 2: 23-26; 1970.*

The sale of agricultural chemicals in Japan is subject to registration with the Minister of Agriculture and Forestry. These chemicals include fungicides, insecticides and others used for the control of pests, as well as herbidides and plant growth regulators. Application for the registration must include information as to the ingredients, names of diseases and insects for which it may be applied, whether it is harmful to men and livestock together, the antidotal method, if necessary, whether it is harmful to aquatic animals and plants, any other pertinent information. The document attached to an application must present test results produced by experimentation. Each of the chemicals approved must bear labels supplying truthful information and cautions regarding storage. Manufacturers and importers are warned to keep accurate books as to the amounts manufactured or imported.

72-2045. Section of Pesticide Residue. (Agr. Chem. Insp. Sta., Kodaira, Tokyo, Japan). **Tolerances for residue and directions for safe use of agricultural chemicals in Japan (1).** *Jap. Pestic. Inform. 3: 24-25; 1970.*

The Ministry of Health and Welfare and the Ministry of Agriculture and Forestry present a tabulation of the tolerances of five agricultural chemicals with reference to four crops. In accordance with the Dietary Hygiene Law of Japan, directions are included for the use of chemicals in safety. The chemicals cited are lindane, DDT, parathion, arsenic, and lead; the crops named are apple, grape, cucumber, and tomato. Directions include method of application, a prohibitive period, the limited number of applications for the individual crops, and the facilities or site of application of the pesticides.

72-2046. Hashimoto, Y. (Agr. Chem. Insp. Sta., Kodaira, Tokyo, Japan). **Evaluation of fish-toxicity of agricultural chemicals.** *Jap. Pestic. Inform. 3: 15-18; 1970.*

The test organisms for the evaluation of toxicity of agricultural chemicals to aquatic organisms in Japan are carp (*Cyprinus carpio*) and either of two kinds of daphnids (*Daphnia pulex*, *Moina macrocopa*). The recommended measure of relative toxicity of agricultural chemicals to fish is the median tolerance limit (TLM) for an exposure period of 24 hr, 48 hr, and 72 hr. The test animals must be acclimatized in the standard testing tank for about one week and a uniform temperature must be maintained. Controls are observed for comparative mortality rates. TLM values are derived by the straight line graphical interpolation method. The rank of each chemical is determined by the degree of the toxicity of its active ingredient or ingredients. A classification of agricultural chemicals based on fish-toxicity is presented for insecticides, fungicides, and herbicides, under 3 different ranks: those of lowest toxicity; those toxic in abnormally large amounts; and those with high latent possibilities of injuring aquatic organisms even when slight amounts are present.

72-2047. Anonymous. **Use of organochlorine insecticides more restricted by notifications issued by Directors General of Livestock and Agricultural Administration Bureaus.** *Jap. Pestic. Inform. 3: 22-23; 1970.*

A notice was issued by the Director General of Livestock Bureau of Japan to prefectural governors regarding the use of organochlorine insecticides in animal feed. Comparatively large amounts of residue of BHC were detected in the milk of cows fed with rice straw. Although results of an investigation indicated that these amounts were not deleterious to health, it was deemed safer to effect a reduction of BHC residue in milk as much as possible. A directive forbids the use of BHC and DDT on grass, forage crop, or in the dairy barn. Organophosphates may be employed, however, for the control of mites. The production of DDT and BHC for domestic use has been discontinued to prevent environmental contamination. A list of safe crops for cattle feed and directions for the safe use of BHC and DDT for fruit and vegetables are appended.

72-2048. Section of Pesticide Residue. (Agr. Chem. Insp. Sta., Kodaira, Tokyo, Japan). **Tolerances for residue and directions for safe use of agricultural chemicals in Japan (2).** *Jap. Pestic. Inform. 4: 23-26; 1970.*

Tables are presented of tolerances (ppm) for residues of agricultural chemicals in crops and the safe use of these chemicals under certain conditions. The chemicals include lindane, DDT, endrin, dieldrin (including aldrin), lead, parathion, and arsenic. The crops for which these chemicals are to be used include strawberry, summer orange (and outer peel), Japanese pear, grape, peach, apple, cabbage, cucumber, tomato, potato, spinach, and tea. Directions for safe use (in Japan) are depicted under the headings of: the method of application; the period before harvest when use is prohibited; the limit of the number of applications; and some precautions as to injurious practices.

72-2049. Suzuki, T. (Agr. Chem. Insp. Sta., Tokyo, Japan). **Japanese policy for safe use of pesticide.** *Jap. Pestic. Inform. 5: 32-35; 1970.*

The Ministry of Health and Welfare has established tolerances for pesticides in accordance with the Food Hygiene Law of Japan. The information is published along with directions for the safe usage of the chemicals reviewed. Residue tolerances are established in accordance with the method recommended by the WHO and FAO, based upon the average daily intake in relation to average weight of consumer. Samples of residue are analyzed for each combination of pesticide and crop under a variety of conditions. The directions for safe use are determined from the results of these analyses and the requirements for the registration of a new chemical from experimental data. Chronic toxicity experiments must satisfy specific requirements which are enumerated. Inspection of pesticide residue is conducted on the basis of the Dietary Hygiene Law.

72-2050. Section of Pesticide Residue. (Agr. Chem. Insp. Sta., Kodaira, Tokyo, Japan). **Tolerances for residue and directions for safe use of agricultural chemicals in Japan (3).** *Jap. Pestic. Inform. 8: 38-40; 1971.*

A tabulation of tolerances and directions for safe use of agricultural chemicals is presented, as drawn up by the Japanese Ministries of Health and Welfare and of Agriculture. This tabulation concerns EPN (ethyl *p*-nitrophenyl phenylphosphonothionate) in: rice; summer orange; Japanese pear; grape; pear; apple; strawberry; cabbage; cucumber; Japanese radish; tomato; spinach; potato; and tea, and DDT, lindane (BHC), aldrin, dieldrin, endrin and parathion in rice and Japanese radish. The tolerances are expressed in terms of ppm and some revisions and additions are incorporated which had not appeared previously in published tables, both as to tolerance and use.

72-2051. Hashimoto, Y. (Environment Agency, Japan). **Amendment of Agricultural Chemicals Regulation Law.** *Jap. Pestic. Inform. 9:15-21; 1971.*

The need to take counter-measures against pesticide residues in food has led to the amendment of the Agricultural Chemicals Regulations Law in Japan. The new law requires documented evidence of test results concerning toxicity and persistence of the residue of an agricultural chemical. Documents dealing with effectiveness and phytotoxicity are required. A number of regulations governing the reinforcement of inspection for registration of chemicals are cited. The agricultural chemical is subject to nullification of its registration if a change should occur in its effects upon subsequent inspection. When a change does occur, a sales restriction is enforced. The new law has been extended to govern the use of agricultural chemicals with respect to crop persistence, soil persistence, and water pollution. A new provision has also been made relative to directions for the use of agricultural chemicals.

72-2052. Lister, R. E.; Bennett, J. M. (Inveresk Res. Internat., Inveresk, Musselburgh, Midlothian, Scotland). **PCBs in copying paper.** *Nature (London) 237(5355): 414; 1972.*

In a Letter-to-the-Editor commenting on an article regarding polychlorinated biphenyls in carbonless copying paper (see Abstract No. 72-1430), the current status of such papers is described. The largest manufacturer of carbonless copying paper in Europe began to reconsider the use of PCBs in copying papers when their persistence in the biomass was first reported in 1966. The Yusho situation, as outlined by the authors of the referenced article, was considered to have little relevance to PCB use in copying papers because a different PCB composition with different toxicologic properties was used. According to toxicologic studies performed by the copying paper manufacturer, the use of low-chlorinated PCBs as solvents presented no hazard to man in the form and amount used. However, in view of the potential hazard of PCBs to the environment in the long run, another solvent with similar physical characteristics but rapid biodegradability is now employed.

72-2053. Papworth, D. S.; Taylor, J. K.; Cutler, J. R.; Muttrie, M. P. (Pest Infestation Control Lab., Ministry of Agr., Fisheries and Food, England). **Quantities of pesticide used by U. K. local authorities: Apr. 1968–March 1969.** *Royal Soc. Health J. 92(1): 35-38; 1972.* (3 references)

Two surveys conducted in the United Kingdom were designed to identify the sources of environmental contamination through pesticides. One unit was to examine uses of pesticides in agriculture and horticulture; the other was to study the use of pesticides to protect food from the time of harvest or import to consumption. This report presents a survey (commenced in 1969) to identify all the major uses of pesticides within local government. Tables present information on: the composition of the sample population surveyed; the quantities of pesticides used on dumps, for public health

and hygiene, and for wood preservation; the quantities of pesticides used for mammal and bird control; herbicides and other horticultural pesticides used; and the quantities of organochlorine pesticides used for horticultural purposes. Approximately half of all organochlorine insecticides obtained by local authorities are used on dumps. The use of malathion in England and Wales may indicate a movement away from organochlorines.

72-2054. Carman, P. C. (Natl. Chem. Res. Labs., S.A.). **The new challenge to chemistry: pollution.** *S. Afr. Chem. Proc. 5(5): 106-110; 1970.*

Pollution is discussed from the chemist's point of view. Because of the greatly increased agricultural productivity made possible by pesticides, fertilizers, and other chemical aids, it is important to control application of the chemicals so as to realize their benefits without endangering the human population. One solution to this problem is to give preference to pesticides which are more easily decomposed than organochlorine compounds. The field of pheromones (or attractants) is of interest and may serve as a means toward pest control. Other problems arise from the use of herbicides; some commercial formulations may have marked teratogenic properties. Air pollution is cause for considerable concern. The automobile and the power plants are primary sources of contaminants. Water pollution poses another threat. The chemist's role is to use his expertise towards avoiding pollution and towards conservation of resources.

72-2055. Grus, I. (Jugohemija, Belgrade, Yugoslavia). **Razmatranja o delovanju i posledicama primene insekticida DDT i HCH u poljoprivredi i stocarstvu. [Consideration of the effect and consequences of using the insecticides, DDT and HCH (BHC), in agriculture and animal husbandry.]** *Veterinaria (Sarajevo) 20(2): 247-261; 1971.* (112 references) (Croatian)

This article reviews the uses, action mechanisms in insects, and toxicology in warm-blooded animals of DDT and BHC. Symptoms of allergy to these insecticides and symptoms of acute and chronic intoxication are described. Special emphasis is placed on the penetration of DDT and BHC into the food chain and concentrations of them found in birds, fish, milk, and eggs. The importance of milk and milk products as sources of DDT is stressed. The consequences of the antagonistic action of the γ-isomer of BHC (lindane) on the vitamin, *m*-inositol, are discussed.

72-2056. Huet, B. J. (Association Francaise de Biometeorologie, F 75 Paris 16e, France) **Les polluants atmospheriques et la biometeorologie urbaine. [Atmospheric pollutants and urban biometeorology.]** *Agressologie 12 (D, special issue): 25-36; 1971.* (16 references) (French)

The different problems and implications of pollution, measurement of pollutant concentrations and atmospheric diffusion, and the dangers of pollution by pesticides (DDT) and herbicides are discussed. Full treatment is given to DDT's pollutant aspect. Even when used only in certain areas, it spreads into the atmosphere and slowly impregnates all living organisms. Pesticides, because of their chemical stability, persist for a long time and affect the ecological equilibrium by contaminating water, plankton, fish, and birds. In addition they accumulate in fatty tissues of animals and are eventually consumed by man. The main danger mentioned created by the use of herbicides lies in their being carried into bodies of water and causing destruction of aquatic vegetation, especially plankton, one of the main sources of oxygen.

72-2057. Trabosh, H. M. (Author address not given). **Monitoring residues in meat & poultry.** *Agr. Mark. 16(4): 12-13; 1971.*

Government plant inspection of meat and poultry for the presence of residues of chemicals, drugs, or pesticides is conducted in two stages in the U.S. Samples of meat or poultry are selected at random from animals slaughtered at the plant for laboratory analysis. When inspectors find a detectable residue in meat from a known origin, the farmer is informed of the corrective action necessary; animals for future slaughter from that farm are tested. The owner of the herd or flock must list animals scheduled for slaughter, submit duplicate samples for analysis by government approved laboratories, and withhold his animals from slaughter while samples are analyzed. If the monitored samples are not in compliance with the regulations, the Consumer and Marketing Service veterinary inspector selects the number of samples required, permits the slaughter of the selected animals, but retains the remainder of the lot. The samples are submitted to the government approved laboratory. The regulations require analyses on two successive lots from the same owner before he may make future shipments.

72-2058. Turk, A.; Turk, J.; Wittles, J. T. (Author address not given). **Pesticides.** *In: Ecology, Pollution, Environment. W. B. Saunders Co.; Philadelphia; 1972. pp. 41-53.* (5 references)

A review of pesticides is presented with introductory remarks on the competition for food between insects and man. The composition, use, and ecological consequences of chlorinated hydrocarbons, especially DDT and related compounds, are discussed. Although these pesticides have been instrumental in saving millions from disease and/or starvation, a campaign exists to ban them on the basis of toxicity, degradation rate, and fat-solubility. Attempts to change pesticides have produced resistance in certain strains of insects which only lead to greater populations. These are helped by the greater fer-

tility rate, the fact that predators eat more pesticides than the original pests, and that fewer predators exist. The advantages and disadvantages of other controls are discussed. These methods include: short-lived pesticides; natural insect enemies (predators, bacteria, parasites); sterilization techniques; insect hormones; sex attractants; resistant crops; and cultural controls (growing the affected crop together with other crops).

72-2059. Borlaug, N. E. (Author address not given). **In defence of DDT and other pesticides.** *UNESCO Courier (2): 4-12; 1972.*

Extracts from the 1971 lecture given at the Food and Agriculture Organization in Rome make reference to the contributions and criticism accompanying the widespread use of DDT. According to Rachel Carson's *Silent Spring*, the use of pesticides, especially DDT, upsets the biological balance and is injurious to fish and wildlife, many of which are faced with the extermination of their species. It is submitted that the reduction in the population of these species is attributable to the law of nature, 'evolve or perish,' and dates back to many years before the discovery of DDT. It is also necessary to remember that millions of people have been freed from the risk of malaria through use of DDT. Although small quantities of DDT or other organochlorine residues have been detected in human and in animal fat, there is little evidence to support the belief that they cause discernible injury to man. Indeed, if the use of pesticides in the USA were to be completely banned, crop losses would probably soar to 50%. Conservationists and environmentalists are urged to investigate the reasons why certain threatened species are on the verge of extinction.

72-2060. Wurster, Charles F. (Marine Science Research Center, State Univ. N.Y., Stony Brook, NY). **Aldrin and dieldrin.** *Environment 13(8): 33-45; 1971.* (144 references)

A review of two persistent hydrocarbon insecticides, aldrin and dieldrin, is presented. Since aldrin is converted into dieldrin in the environment, application of either compound yields residues of dieldrin, the ultimate environmental contaminant. The specific properties of these two chemicals are considered under the categories of: mobility (they enter the air and surface waters and are dispersed over great distances); persistence (dieldrin is one of the most stable of all insecticides and its residues remain active in the environment for many years); solubility characteristics (more soluble in living tissues than in water); and biological activity (toxic to vertebrates, more toxic than DDT). Mortality to fish and wildlife has been spectacular. Sublethal effects on nontarget organisms have resulted in changes in normal growth or behavior patterns and effects on reproduction. Other effects on birds, fish, and organisms are described. Behavioral effects on humans have also been studied in workers exposed to these insecticides. Carcinogenic effects and enzyme induction are believed to occur in humans.

72-2061. Williams, W. A. (Author address not given). **Pesticide overuse condemned.** *Health Bull. 87(5): 3; 1972.*

Pesticides have contributed to the control of disease and the production of ample food, and are essential to the modern way of life. However, their overuse is dangerous and unnecessary. Pesticides, designed to kill destructive forms of life, also can kill non-target organisms as well and can contaminate the environment if used improperly. A program in North Carolina revealed that when pesticides are used as needed, rather than by the calendar, as much as a 90 percent decrease in their usage could be affected.

72-2062. Anonymous. **Let's be honest.** *Ind. Res. 14(8): 9; 1972.*

In an editorial, criticism is directed at the manner in which hearings were conducted with respect to the use of DDT in the U.S. It is claimed that some of the ecologists and environmental scientists who appeared at the EPA hearings presented questionable evidence. The case is cited of an ecologist who testified about the buildup of DDT in the environment. However, one month previously, he had published data that showed that most of the DDT produced was either degraded or sequestered in places where it was not available to plant and animal life.

72-2063. Lisella, F. S. (Author address not given). **The significance of pesticides and other chemicals in the environment.** *Interaction; J. Ohio Pub. Health Ass. 5(4): 1-12; 1972.* (21 references)

The beneficial effects of pesticides to man are enumerated and their detrimental effects discussed. Ambient air samples have varied in pesticide content. Water supplies are contaminated either directly or indirectly and include waste from pesticide manufacturing plants. Such discharges are responsible for the mortality of various types of aquatic life. Pesticides in the soil may affect the crops or be absorbed by plants and affect fish and wildlife populations. Residues of pesticides in humans suggest that the immediate environment may be a reservoir for the chemicals. The chlorinated hydrocarbons persist in human and animal fat. The buildup or biomagnification of pesticide in wildlife species which may be a source of food for man is linked to health hazards associated with mercury, lead, and arsenic.

72-2064. Macpherson, A. H. (Western Region, Canadian Wildlife Serv., Dept. of the Environ., Edmonton, Ont., Canada). **Pesticides and man.** *Nature (London) 237(5355): 413-414; 1972.*

In a Letter-to-the-Editor commenting on the article by John Maddox (see Abstract No. 72-1822), statements concerning the damage done to wildlife by hunting are questioned. Legal recreational cropping is said not to endanger the continued existence of any North American game bird. The efforts of hunting enthusiasts have provided much of the impetus to the conservation movement until a few years ago. Persistent pesticides are said to be more responsible for the almost complete extinction of several bird species than game hunting. Well-managed hunting versus pesticides can be likened to the butchering of cattle versus anthrax. Neither activity will be permitted to reduce the species' viability.

72-2065. Nishiuchi, Y. (Dept. of Toxicity to Wildlife, Nat. Agr. Chem. Insp. Sta., Minis. of Agr. and For., Kogenei-shi, Tokyo, Japan). **[Toxicity of pesticides to aquatic animals, classification and problems for the future.]** *Noyaku (Pesticides) 19(2): 37-41; 1972.* (Japanese)

The Japanese Ministry of Agriculture and Forestry published a table in January 1972, assigning each registered pesticide to one of four classes based on its toxicity to aquatic organisms. Every pesticide package is required to carry this class designation and instructions for avoiding injury to aquatic life. The table will be revised annually and newly registered pesticides added. Class A includes pesticides with TLM48(median lethal concentration, 48 hr) greater than 10 ppm and not toxic to crustaceans. Class B includes pesticides with TLM48 of 0.5-10 ppm, but toxic to crustaceans. Pesticides with less than 0.5 ppm are assigned to Group C. Other pesticides with high toxicities to specific organisms, including endrin, telodrin, benzoepin, rotenone, and PCP are classified in group D. However, additional studies in this field are needed because of the marked differences in the pesticide susceptibilities of important marine fishes, the unexpected phenomenon of abnormal flexion of the vertebrae possibly due to pesticides, and the lack of information on the effects of metabolites and degradation products on aquatic life.

72-2066. Siriez, H. (Author address not given). **Residus de pesticides ou de polychlorodiphenyles? [Residues of pesticides or of polychlorinated diphenyls?]** *Phytoma No. 240: 27-28; 1972.* (French)

The controversy over the significance of detection of traces of DDT in the environment using the gas-liquid chromatography method is briefly discussed. The 'unfounded hysteria' of environmentalists and nonprofessionals is deplored. Difficulties in identifying the origin of chlorinated hydrocarbons detected in different samples are stressed. It is suggested that other compounds, especially polychlorinated biphenyls, which are widely used in industry, obscure the results of tests for the detection of pesticides.

72-2067. Viel, G. (Laboratoire de Phytopharmacie, INRA, France). **La chromatographie gaz-liquide et le dosage des residue pesticides. [Gas-liquid chromatography and the determination of pesticide residues.]** *Phytoma No. 240: 28-30; 1972.* (French)

The principles of gas-liquid-chromatography are described, emphasizing that extreme sensitivity often yields false positive results. The positive results of analyses for pesticides obtained by B. E. Frazier et al. on samples of soil dating to 1909 (before these compounds were used) illustrate the pitfalls of a method which is too sensitive. It is suggested that in determinations of pesticide residues in food, it is not necessary to use a method of extreme sensitivity. Detection of such infinitesimal amounts (0.01 – 0.05 ppm) in food has no practical value.

72-2068. Sievers, J. F. (Institut fuer Wasser-, Boden- und Lufthygiene, 1 Berlin 33, Germany). **Pestizide und Umwelt. [Pesticides and the environment].** *Schriftenr. Ver. Wasser- Boden- Lufthyg. 34: 5-8; 1971.* (4 references) (German)

In the Introduction to the 'Symposium on Water and Pesticides' sponsored by the Institut fuer Wasser-, Boden- und Lufthygiene, the vast need for information concerning the effects of synthetic chemicals on the environment is emphasized. The principles and methods available for estimating environmental damage are still sparse. Data interpretation is difficult. On the basis of laboratory studies determining the solubility of pesticides in distilled water, it would seem impossible for pesticide concentrations toxic to fish to develop. They occur due to the presence in natural waters of various life forms, suspended matter, dissolved organic and inorganic components, oils, etc., which can adsorb or even dissolve pesticides. Furthermore, rainwater carries pesticide quantities, adsorbed on its dust particles, far higher than those expected on the basis of its solubilizing capacity alone. Degradation processes further complicate the picture.

72-2069. Lewandowski, G. (Bundesgesundheitsamt, 1 Berlin 33, Germany). **Juristische Bemerkungen zu einigen Aspekten des Zulassungsverfahrens von Pflanzenschutzmitteln. [Legal remarks on some aspects of the registration process for plant-protection agents.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. 34: 77-83; 1971.* (German)

The West German Plant Protection Law of May 10, 1968, states that registration will be granted after testing a plant protection agent if it is sufficiently effective, does not contradict the requirement for protecting the health of man and animals, and has no other harmful effects which are not justifiable according to the current state of scientific knowledge. The customary legal practice of evaluating in accordance with precedents seems inappropriate for making such determinations since

knowledge in the area of environmental effects is in a constant state of flux. In such cases the significance of advantageous and disadvantageous effects must be weighed in the light of all of the influential factors: chemical formulation, area of application, instructions for use – all of the data required to accompany the application. The maximum registration period of 10 years as provided by the current law will probably be granted rarely, given the new findings which can be expected. It is thus apparent that the registration of an agent does not represent a confirmation for all time.

72-2070. Bathe, R. (CIBA Aktiengesellschaft, CH 4002, Basel, Switzerland). **Die toxikologische Beurteilung eines Pflanzenschutzmittels unter besonderer Beruecksichtigung des Umweltschutzes. [The toxicologic evaluation of a plant-protection agent, with particular consideration of environmental protection.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. 34: 29-34; 1971.* (8 references) (German)

A toxicology testing program for agricultural chemicals should be designed to supply the data demanded by government agencies for pesticide registration and needed by the industrial firm itself for evaluation. Following establishment of efficacy, acute toxicity tests are performed on various species to provide preliminary information on potential hazards to laboratory and production personnel. These initial tests also permit classification of the pesticide in accordance with government regulations for the protection of the user. Subacute toxicity testing serves to establish the dosages to be used in the subsequent experiments and provides additional information on occupational hygiene. Ideally, sensitization experiments are performed at this time. The final stage includes 2-year feeding experiments with rats and dogs to provide information on long-term toxicity and carcinogenicity. If needed, testing for teratogenicity, interactions with other chemicals, and neurotoxicity occurs. In addition, field observations by trained inspectors aid in detecting effects on wildlife.

72-2071. Schuphan, W. (Bundesanstalt fuer Qualitaetsforschung Pflanzlicher Erzeugnisse, 6222 Geisenheim/ Rheingau, Germany). **Potentielle und reale Gefahren von Duengungsmassnahmen und Pestizideinsatz fur die Umwelt. [Potential and actual hazards of fertilizer and pesticide use for the environment.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. 34: 35-50; 1971.* (63 references) (German)

Man places stress on the environment often through excessive use of chemical fertilizers and pesticides. According to some reports, excessive reliance upon chemical fertilizers, rather than on the balanced plant nutrients supplied by decomposition, predisposes plants to attack by pests. The requirement for insecticides and fungicides thus increases. The persistent chlorinated hydrocarbons cause the most serious environmental contamination. The acute toxicity of DDT is lower than that of the other chlorinated hydrocarbons; the chronic toxicity of the organophosphates is lower than that of the organochlorines. Many support the theory of the aeolian route of contamination: pesticides applied to fields evaporate and are carried for some distance by wind, possibly adsorbed on dust particles. Falling with the rain onto untreated croplands or flowing into the sea, the particles demonstrate in theory how pesticide contamination can be present where pesticides were never applied.

72-2072. Luedemann, D. (Institut fuer Wasser-, Boden- und Lufthygiene, 1 Berlin 33, Germany). **Zur Problematik der verschiedenen Fischtoxizitaetstests und ihrer Vergleichsmoeglichkeiten. [Problematics of the various fish toxicity tests and possibilities for comparing them.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. Berlin-Dahlem. 34: 77-83; 1971.* (German)

Despite decades of studies, many questions of experimental design in the testing of pesticides for toxicity to aquatic organisms remain unanswered. From the viewpoint of relevance to commercial fishing, it is desirable to select test fish such as carp and rainbow trout. However, preliminary tests may be performed on guppies, which resemble rainbow trout in their responses to many substances. It is necessary to test both active ingredients and commercial formulations since some formulating aids, such as solvents and emulsifiers, may be more toxic to fish than the active ingredient. The critieria of toxicity used presently include: the lower threshold value (first signs of injury), the LC50 (value at which half of the animals die within a certain time period), and the LC100 (value at which no test fish survives). Graphs and statistical evaluations are then employed to clarify, confirm, or illustrate the biologically significant results. Internationally standardized acute and chronic toxicity test methods not requiring excessively complicated equipment should be developed to permit comparison of results obtained in various laboratories.

72-2073. Drescher, N. (Badische Anilin- und Sodafabrik AG, Landwirtschaftliche Abteilung, 6703 Limburgerhof, Germany). **Ueberlegungen der Pflanzenschutzmittel-Industrie zur Erarbeitung von Unterlagen ueber die potentielle Grundwasserverunreinigung durch Wirkstoffrueckstaende. [Considerations of the plant-protection-agent industry regarding the generation of data on the potential contamination of groundwater by active-ingredient residues.]** *Schriftenr. Ver. Wasser-Boden- Lufthyg. 34: 51-56; 1971.* (German)

The application form for pesticide registration published by the Biologische Bundesanstalt (BBA) comprises approximately 75 questions regarded by the BBA as essential for their evaluation of a pesticide. The early stages of the toxicological testing supply relevant

data on water pollution and include information on persistence and the acute and chronic toxicity of the preparation to animals, man, and fish. Additional efforts are needed in the area of analytical methodology. The methods require refinement to the point where they can detect pesticide levels equal to one-tenth of the probable tolerance, calculated by inserting the value of 200 g per day (water consumption) into the Holland formula. In addition experiments with soil columns help resolve questions concerning soil leaching of pesticides.

72-2074. Russel, P. F.; (answered by): Epstein, S. S. (Westover, North Edgecomb, ME 04556). **DDT toxicology.** *Science 177(4047): 387-388; 1972.* (3 references)

Criticism has been directed at statements made by Samuel S. Epstein, who testified before the EPA that the current practice of toxicology is inadequate and that animal experiments are grossly insensitive and artificial in design. However, on the basis of animal experiments, he states positively that DDT has been shown to be carcinogenic. However, it has been pointed out that not a single case of human cancer due to DDT has been proven anywhere in the world, even among employees of a DDT plant. Epstein responded by reaffirming his opinion on toxicology and stating that it is difficult to demonstrate carcinogenic and other adverse effects of chemicals which are widely disseminated in the environment.

72-2075. Maas, V. (Author address not given). **Can DDT be tamed?** *Successful Farming 69(10): 8; 1971.*

Two California scientists, Keith Sweeny and Rod Fisher, have developed a non-toxic chemical causing DDT to decompose several weeks after application. In its present form, DDT takes 10 to 12 years to decompose. A catalyst regulated by the user would thus be highly beneficial. Ascertaining that the customary degradation product, DDE, does not form will be necessary. Sweeny believes that the most promising approach centers around the removal of three of the five chlorine atoms contained in DDT. The resulting compound has been shown to be only one tenth as toxic as the original compound in tests with mice.

72-2076. Ginsberg, A. (New Zealand High Commission, New Zealand House, Haymarket, London S.W.1, England). **The next ten years of meat hygiene.** *Vet. Rec. 89: 528-530; 1971.*

Modern methods of stock-raising and changes in meat production, preparation, preservation, distribution, and consumption demand more sophisticated methods in meat inspection. The presence of pesticides and insecticides in meat has led to public demand for legislation and strict control regarding the limitation of residues in food. Increased attention should be paid to the welfare of slaughter stock and should include *ante* and *post mortem* avoidance of contamination. With the present knowledge of diseases, their prevention and eradication, meat hygiene includes the control of the feeding of chemicals or drugs and the implantation of hormones. Meat production methods in modern factories are described.

72-2077. Birke, G.; Johnels, A. G.; Plantin, L.-O.; Sjoestrand, B.; Skerfving, S.*; Westermark, T. (Res. Dep., Nat. Food Adm., S-104 01, Stockholm 60, Sweden). **Studies on humans exposed to methyl mercury through fish consumption.** *Arch. Environ. Health 25(2): 77-91; 1972.* (57 references)

Human subjects exposed to methyl mercury through consumption of fish were studied during and after varying degrees of exposure. Methyl mercury made up half or less of the blood cell total mercury in "normal" subjects. The proportion was higher in heavily exposed subjects. There was a relationship between exposure to methyl mercury by ingestion of fish and blood mercury levels, and between mercury levels in blood and hair. No symptoms and signs indicating methyl mercury poisoning were observed in subjects exposed at most to 0.8 mg of mercury as methyl mercury per day and having mercury levels of up to 1,200 ng/gm blood cells and 185,000 ng/gm hair. After the end of exposure, biologic half-life of mercury was 33 to 120 days in hair and 99 to 120 days in blood cells in five and two subjects, respectively. (Author abstract by permission)

72-2078. Parlar, H.; Korte, F. (Institut fuer Oekologische Chemie, 5205 St. Augustin, Schloss Birlinghoven, Germany). **Beitraege zur oekologischen Chemie XLIV. Reaktionsverhalten von Chlorden in Loesung und in der Gasphase bei UV Bestrahlung. [Contributions to ecological chemistry XLIV. Reaction behavior of chlordene in solution and in the gas phase under UV irradiation.]** *Chemosphere 1(3): 125-128; 1972.* (5 references) (German)

Chlordene was irradiated with a mercury vapor lamp at wave lengths above 300 nm in *n*-hexane for dechlorination reactions, in acetone for dimerization and ring opening reactions, and in the gas phase for photoisomerization reactions. The products formed were examined by thin-layer chromatography, gas-liquid chromatography, and mass spectrometry. The formation of heptachlor and isoheptachlor from chlordene upon irradiation in *n*-hexane indicated that the reactions favor a free radical or a transfer mechanism. Two types of photocycloaddition, intermolecular and intramolecular, are possible. The intermolecular reaction yields the dimer. Free-radical reactions result in ring opening.

72-2079. Parlar, H.; Klein, W.; Korte, F. (Institut fuer Oekologische Chemie, 5205 St. Augustin, Schloss Birlinghoven, Germany). **Beitraege zur oekologischen Chemie XLV. Photodechlorierungsreaktionen des Kelevan (Decachloro-octahydro-2-hydroxy-1,3,4-methano 2*H*-cyclobuta(*c,d*)pentalen-2-laevulin-saeureaethylester). [Contributions to ecological chemistry XLV. Photodechlorination reactions of Kelevan (decachloro-octahydro-2-hydroxy-1,3,4-methane 2*H*-cyclobuta(*c,d*) pentalene-2-levulinic acid ethyl ester.]** *Chemosphere 1(3): 129-132; 1972.* (3 references) (German)

The photodechlorination of Kelevan in acetone and methanol during UV irradiation (using a mercury vapor lamp, quartz filter) was evaluated. Mono- and didechlorinated photolysis products were isolated and identified using nuclear magnetic resonance and mass spectrometry. The spectroscopic studies indicated that the two chlorine atoms were lost successively from the base of the bridge to which the hydroxyl group was attached. Very small quantities of another product, less polar than Kelevan, were also formed. This product was probably the result of monodechlorination on the methano bridge, but could not be isolated due to minute quantities.

72-2080. Morris, R. L.; Johnson, L. G.; Ebert, B. S. (State Hyg. Lab., Iowa City, IA 52632). **Pesticides and heavy metals in the aquatic environment.** *Health Lab. Sci. 9(2): 145-151; 1972.* (10 references)

Between 1968 and 1971, maximum annual values of pesticides in various Iowa rivers ranged from undetectable to 0.3 ppb. The highest values were found after rainy periods. Maximum values (dieldrin 0.22 ppb, DDT 0.055 ppb, DDE 0.030 ppb) were recorded in the Nishnabotna River following a localized heavy rainfall, which washed large quantities of silt into the river. High pesticide values are associated with elevated turbidities, which seems to indicate that the pesticides are attached to soil particles. Polychlorinated biphenyls were found in the Raccoon River at the 0.5 ppb level in July and August of 1971. Their source was not determined. Heptachlor was found in the Nishnabotna at 0.6 ppb on one occasion. Dieldrin contents of river bottom silts ranged from less than 1 ppb in the upper Iowa River to 35 ppb in the Des Moines River. The flesh of catfish collected in the Nishnabotna river contained 1600 ppb dieldrin, 280 ppb DDE, 180 ppb TDE, 73 ppb DDT, 86 ppb heptachlor epoxide, 270 ppb aldrin, and 72 ppb chlordane. Catfish from other rivers contained smaller quantities of pesticides, and catfish taken from the Mississippi at Burlington contained 2300 ppm of PCBs. Fish may serve as useful composite sampling devices for organochlorine pesticides and heavy metals.

72-2081. Araki, T. (Food Chem. Sect., Ministry of Health and Welfare, Japan). **Establishment of tolerances for residues in Japan.** *Jap. Pestic. Inform. 9: 28-31; 1971.*

Tolerances for pesticide residues are tabulated and include arsenic, lead, lindane, DDT, parathion, dieldrin (including aldrin), endrin, and EPN. The crops listed include apple, cabbage, cucumber, grape, Japanese pear, peach, potato, radish (tops and roots), rice, spinach, strawberry, summer orange (and peel), and tea. The basic considerations governing the establishment of tolerances for pesticide residues in Japan are dependent upon the acceptable daily intake, the actual pesticide residue, and the daily consumption. For the evaluation of a new pesticide, the considerations of its method of use and estimated residue and the results of both acute

and subacute toxicity tests determine its use. In this case, reports from abroad are acceptable in most instances.

72-2082. Keil, J. E.; Weston, III, W.; Loadholt, C. B.; Sandifer, S. H.; Colcolough, J. J. (Dept. of Prev. Med., The Med. Univ. of S. Carolina, Charleston, SC 29401). **DDT and DDE residues in blood from children, South Carolina–1970.** *Pestic. Monit. J. 6(1): 1-3; 1972.* (7 references)

DDT and DDE residue levels in blood plasma from 192 children in South Carolina, ages 6-9 yr, indicated that Negro children had levels two to three times higher than white children. DDT residues averaged 18.4 ppb in Negroes and 6.7 ppb in whites; DDE values for these two races were 55.6 ppb and 24.8 ppb, respectively. White males in this group also had significantly higher levels of both compounds than white females. From the data in this study, baseline levels for a high-risk pediatric group, usually prone to pesticide poisoning, were established. (Author abstract by permission)

72-2083. Newton, K. G.; Greene, N. C. (State Health Lab., 5 Parliament Pl., Melbourne, Victoria, Australia 3002). **Organochlorine pesticide residue levels in human milk–Victoria, Australia–1970.** *Pestic. Monit. J. 6(1): 4-8; 1972.* (8 references)

Samples of human milk were collected in 1970 from 39 rural and 28 urban donors in Victoria, Australia, and were analyzed for organochlorine pesticides using electron-capture gas chromatography. All samples contained DDT, DDE, and HCB. Twenty-nine contained dieldrin (mean 0.006 ppm), 12 contained DDD (mean 0.007 ppm), and 3 contained both dieldrin and DDD. Total DDT averaged 0.139 ppm for rural 0.145 ppm for urban donors, and HCB averaged 0.042 ppm and 0.063 ppm, respectively. (Author abstract by permission)

72-2084. Warnick, S. L. (Utah Community Pestic. Study, State of Utah Dept. of Social Services, Div. of Health, 44 Medical Drive, Salt Lake City, UT 84113). **Organochlorine pesticide levels in human serum and adipose tissue, Utah–fiscal years 1967-71.** *Pestic. Monit. J. 6(1): 9-13; 1972.* (23 references)

Organochlorine pesticide residue levels were determined in 1,417 serum and 103 adipose samples collected during fiscal years 1967-71 from residents of Utah; levels agreed closely with values reported for persons from other parts of the United States. The results supported previous evidence of no increase in pesticide storage in the general population since 1951 and a tendency towards decreased storage since 1966. Specific findings from the Utah samples included the following: Significantly higher organochlorine levels were found in samples from persons occupationally exposed to pesticides than in those from the general population. Significantly higher levels of DDE were found in serum samples from persons 21 years of age and older than in those from persons under 21. Although residue levels were higher in males than in females, the difference was not significant. Mean values of total DDT in adipose tissue for the years in which these samples were obtained were 9.0 ppm in 1968, 7.2 ppm in 1969, and 5.3 ppm in 1970, indicating a decrease in storage levels. Lastly, results from studies of the relation between residue levels in serum and adipose tissue, between levels in serum and food, and between serum and household dust, indicated no significant correlations. However, the latter two correlations closely approximated a significant relationship, and the results suggested that the respiratory route of exposure to pesticides may be as significant as dietary intake in maintaining an individual's body burden of pesticides. (Author abstract by permission)

72-2085. Baetke, K. P.; Cain, J. D.; Poe, W. E. (Mississippi Community Study on Pestic. Dept. of Biochem., Mississippi State Univ., State College, MS 39762). **Mirex and DDT residues in wildlife and miscellaneous samples in Mississippi–1970.** *Pestic. Monit. J. 6(1): 14-22; 1972.* (11 references)

Samples of wildlife and a few miscellaneous samples, such as beef, were collected in Mississippi in 1970 and analyzed for the presence of mirex and DDT and its analogs. Levels of mirex residues were found to range from 0 ppm to a high of about 104 ppm; residues of DDT and its metabolites (DDTR = DDT + DDE + DDD) were found to range from <0.001 ppm to 126 ppm. Comparisons of the amounts of the two pesticides found in individual samples showed that mirex residues often exceeded DDT residues. Collections of wildlife were begun in the spring of 1970, 1 year after mirex had been applied by aerial application in the primary study area. The high levels of mirex residues found in some of these samples 1 year after treatment indicate that mirex can be considered a persistent pesticide. (Author abstract by permission)

72-2086. Carr, R. L.; Finsterwalder, C. E.; Schibi, M. J. (U.S. Food and Drug Admin., 1141 Central Parkway, Cincinnati, OH 45202). **Chemical residues in Lake Erie fish–1970-71.** *Pestic. Monit. J. 6(1): 23-26; 1972.* (6 references)

Yellow perch, coho salmon, carp, channel catfish, freshwater drum, and white bass from the Ohio shore of Lake Erie were analyzed during 1970-71 for residues of chlorinated pesticides (DDE, TDE, DDT, and dieldrin), polychlorinated biphenyls (PCB's), and mercury. All but 1 of the 80 samples analyzed contained DDT and/or its metabolites; PCB's were found in all samples. Fifty-three of the 80 samples were analyzed for mercury, and all were found positive. Average levels of residues for the species sampled ranged from 0.06 to 0.42 ppm for DDE; 0.08 to 4.4 ppm, PCB's; and 0.12 to 0.64 ppm, mercury.

The highest average residue levels of total DDT were in coho salmon and channel catfish. Average levels of PCB's were significantly higher in channel catfish, and levels of mercury were significantly higher in white bass. (Author abstract by permission)

72-2087. Martin, W. E. (Pestic. Appraisal and Monit. Branch, Div. of Wildlife Serv. Bur. of Sport Fisheries and Wildlife, U.S. Dept. of the Interior, Washington, D.C. 20240). **Mercury and lead residues in starlings–1970.** *Pestic. Monit. J. 6(1): 27-32; 1972.* (8 references)

Starling (*Sturnus vulgaris*) samples from 125 randomly selected sites were analyzed for mercury residues. Except for three locations, all samples had residues well below 0.5 ppm. Lead residues were identified in all samples from 23 survey sites that had been tentatively selected to evaluate use of starlings as a biological measure of environmental contamination by lead. Residues of lead ranged from 0.4 to 13.3 ppm with a mean of 3.18 ppm and a standard error of 0.62 ppm. (Author abstract by permission)

72-2088. Martin, W. E.; Nickerson, P. R. (Branch of Pestic. Appraisal and Monit. Div. of Wildlife Serv. Bur. of Sport Fisheries and Wildlife, U.S. Depart. of the Interior, Washington D.C. 20240). **Organochlorine residues in starlings–1970.** *Pestic. Monit. J. 6(1): 33-40; 1972.* (3 references)

As part of the National Pesticide Monitoring Program, starlings were collected in November and December 1970 from 125 sites throughout the contiguous United States and analyzed for certain persistent organochlorine insecticides. DDT and its metabolites dieldrin, heptachlor epoxide, and benzene hexachloride (BHC) were found in all samples. Polychlorinated biphenyls, (PCB) which were estimated using Aroclor 1254 as a standard, were also found in all samples. A comparison of 1970 residue data with baseline information from 1967-68 indicates an apparent decline in levels of DDT and its metabolites and dieldrin; however, the decline is not significant at the 95% confidence level. (Author abstract by permission)

72-2089. Oberheu, J. C. (Bur. of Sport Fisheries and Wildlife, U.S. Dept. of the Interior, Atlanta, GA 30323). **The occurrence of mirex in starlings collected in seven southeastern states–1970.** *Pestic. Monit. J. 6(1): 41-42; 1972.* (6 references)

Selected samples of starlings collected for the National Pesticides Monitoring Program were analyzed for mirex, the chemical used for eradication of the imported fire ant. Whole bodies (less skin, beak, feet, and outer wings) of 10 birds from each sampling site were pooled for analysis. Residues present in 10 of the 12 sample pools ranged from 0.01 to 1.66 ppm. (Author abstract by permission)

72-2090. Reinke, J.; Uthe, J. F.; Jamieson, D. (Fisheries Res. Bd. of Canada, Freshwater Inst., Winnipeg 19, Manitoba, Canada). **Organochlorine pesticide residues in commercially caught fish in Canada–1970.** *Pestic. Monit. J. 6(1): 43-49; 1972.* (7 references)

Organochlorine pesticide residues were determined from commercially caught fish from a total of 78 locations in 68 central Canadian lakes and rivers. Only a few of these waters yielded fish with appreciable concentrations of DDT and its analogs (>1 ppm), and in only a few cases did the concentrations exceed the maximum permissible level of 5 ppm. Of the other organochlorine pesticides commonly used, namely lindane, aldrin, heptachlor, heptachlor epoxide, endrin, dieldrin, and chlordane, only dieldrin was found at significant levels in a number of samples, but these amounts were still below the maximum permissible level. Trace amounts of lindane were found in some samples. The presence of polychlorinated biphenyls (PCB's) was noted in samples from the Great Lakes and the south end of Lake Winnipeg. All results were confirmed by multiple-column gas chromatography and thin layer chromatography. PCB's were separated from DDE on aluminum oxide G (type E) plates run in a triethylamine-hexane solvent system. (Author abstract by permission)

72-2091. Wiemeyer, S. N.; Mulhern, B. M.; Ligas, F. J.; Hensel, R. J.; Mathison, J. E; Robards, F. C.; Postupalsky, S. (Bur. of Sport Fisheries and Wildlife, Patuxent Wildlife Res. Center, Laurel, MD 20810). **Residues of organochlorine pesticides, polychlorinated biphenyls, and mercury in bald eagle eggs and changes in shell thickness–1969 and 1970.** *Pestic. Monit. J. 6(1): 50-55; 1972.* (35 references)

Twenty-three bald eagle eggs collected in Alaska, Maine, Michigan, Minnesota, and Florida during 1969 and 1970 were analyzed for organochlorine pesticides, polychlorinated biphenyls (PCB's), and mercury. All eggs contained residues of DDE, dieldrin, PCB's and mercury. Average residue concentrations were lowest in eggs from Alaska. Significant eggshell thinning has occurred among eggs from most major areas sampled. Some eggs contained DDE residues of the same magnitude as those that produced shell thinning in experimental species. High dieldrin residues in some eggs could be having an adverse effect on reproductive success. (Author abstract by permission)

72-2092. Bevenue, A.; Hylin, J. W.; Kawano, Y.; Kelley, T. W. (Dept. of Agri. Biochem. Univ. of Hawaii, Honolulu, HI 96822). **Organochlorine pesticide residues in water, sediment, algae, and fish, Hawaii–1970-71.** *Pestic. Monit. J. 6(1): 56-64; 1972.* (27 references)

Rainwater, drinking water, and nonpotable waters in Hawaii were sampled and found to contain chlorinated insecticide residues in the low parts-per-trillion range. Dieldrin, *p,p'*-DDT, and lindane were the pesticides most prevalent; pentachlorophenol (PCP) was present in samples from a sewage fallout. The ratio of chlorinated pesticide residues in canal waters to residues in algae, sediment, and fish from the same canals was 1:4,000:9,000:32,000, respectively. According to proposed water quality standards, results of this study indicated that pollution of Hawaii's water by organochlorine pesticides does not occur to any significant degree. (Author abstract by permission)

72-2093. Tarrant, R. F.; Moore, D. G.; Bollen, W. B.; Loper, B. R. (Pacific Northwest Forest and Range Exp. Sta. U.S. Dept. of Agr. Forest Serv. Corvallis, OR 97330). **DDT residues in forest floor and soil after aerial spraying, Oregon–1965-68.** *Pestic. Monit. J. 6(1): 65-72; 1972.* (44 references)

One month after aerial application of DDT (12 oz/acre) to an eastern Oregon forest, 3 oz/acre of DDT residues (DDT, its isomers and metabolites–DDD (TDE), DDE, *p,p'*-DDT) were detected in the forest floor; 3 years later the DDT content had decreased by more than 50%, and had not leached into the surface mineral soil. At the time of spraying, water from two streams draining the sprayed area had a total DDT content of about 0.3 ppb. This low concentration decreased rapidly to levels below limits of analytical detection. No effect of the spraying was noted on soil microbial populations, nitrification rate, or amount of nitrate nitrogen in the soil. Of the 12 oz of DDT applied per acre, about 26% reached the ground surface initially; and over 36 months, about 6% more was brought to the ground in litterfall. Thus, approximately one-third of the sprayed chemical reached the forest floor. The need for more efficient aerial methods of chemical application is evident. (Author abstract by permission)

72-2094. Keil, J. E.; Loadholt, C. B.; Brown, B. L.; Sandifer, S. H.; Sitterly, W. R. (Dept. of Prevent. Med., The Med. Univ. of S. Carolina, Charleston, SC 29401). **Decay of parathion and endosulfan residues on field-treated tobacco, South Carolina–1971.** *Pestic. Monit. J. 6(1): 73-75; 1972.* (4 references)

Parathion and endosulfan were applied three times at rates of 1.5 and .5 lb/acre, respectively, to field tobacco in South Carolina in an effort to determine the time required for these pesticides to degrade to "zero" residue levels. The maximum times were estimated to be 7 days for parathion and 10 days for endosulfan. During the study period, weather was characterized by high reainfall and temperatures averaging 80° F. (Author abstract by permission)

72-2095. Carp, A. E.; Liska, B. J.; Ziemer, P. L. (Food Sciences Inst. and Dept. Bionucleonics, Purdue Univ., Lafayette, IN 47907). **Decomposition of aldrin by gamma radiation I. In organic solvents.** *Bull. Environ. Contam. Toxicol. 7(6): 321-330; 1972.* (14 references)

Food preservation by gamma radiation is the basic aim of a study on the effect of such radiation on aldrin. The investigation included a study of the effects of varying the concentration of aldrin, the total dose of gamma radiation absorbed by aldrin solutions, temperature at which irradiation was accomplished, and the effects of various solvents. The analysis made use of gas chromatography, infrared analysis, spectrophotometry and mass spectrometry. Results revealed that the total absorbed dose increased concomitantly with increased decomposition of aldrin. As the percent of aldrin remaining in the sample decreased, the amounts of the products formed increased. The major radiation product has a retention time relative to aldrin of 0.72, the second major product one of 1.20. The amount of the first compound increased significantly with temperature; that of the second decreased with temperature. Solutions of aldrin with hexane, acetone, and cyclohexane at an initial concentration of 1 mg/ml were irradiated at a dosage of 6.0 Mrad at 0°C. The aldrin-hexane solution revealed the lowest number of peaks, and aldrin was approximately 65% degraded in this solvent. Some of the isomers, identified by various methods, are delineated.

72-2096. Carp, A. E.; Liska, B. J.; Ziemer, P. L. (Food Sciences Inst. and Dept. Bionucleonics, Purdue Univ., Lafayette, IN 47907). **Decomposition of aldrin by gamma radiation II. In lipid solutions.** *Bull. Environ. Contam. Toxicol. 7(6): 331-337; 1972.* (5 references)

The effects of gamma radiation, type of solvent, and various conditions of packing and storing on aldrin were studied in connection with the use of gamma radiation in the preservation of food. Aldrin was irradiated under various conditions: without temperature control and at −196°C; dissolved in lard or oil; packed in air or nitrogen atmospheres. After irradiation it was stored in the dark at either room temperature or at −20°C. Control samples were maintained and stored under conditions similar to their irradiated counterparts, but were not irradiated. The samples, after extraction and cleanup, were analyzed by gas chromatography. The results indicated several significant treatments and interactions, but emphasized the large temperature effect in contrast to other treatments. Samples irradiated in air at −196°C and stored at room temperature had about 4% less of peak 2 (0.80 degraded) than those irradiated in nitrogen under similar conditions. At an initial concentration of 1 mg/ml, aldrin was degraded approximately 20% in the lipid samples (gamma irradiated to 6.0 Mrad.). The only factor which produced major alterations in the amounts of isomers formed was the temperature at which irradiation was accomplished.

72-2097. Kiigemagi, U.; Terriere, L. C. (Dept. Agr. Chem., Oregon State Univ., Corvallis, OR 97331). **Persistence of DDT in orchard soils.** *Bull. Environ. Contam. Toxicol. 7(6): 348-352; 1972.* (5 references)

Treatment of orchards with DDT and dicofol resulted in a contamination of the upper 6 in of the soil. The soils of the Hood River orchard in north-central Oregon and the Medford orchard in southern Oregon were subjected to further examination after a 5-yr lapse. Soil extracts were analyzed by electron-capture gas chromatography. The relatively high levels of dicofol and DBP (a dioxin) found in the upper layers were attributed to the more recent application of dicofol; however, the high value for DBP cannot be explained. There was a substantial decrease in the amount of DDT and its analogs in the top 6 ins (about 30%) which is attributable to a downward movement; the remainder may have been lost by evaporation or degradation to undetectable products. There was a sharp increase in the pesticide residues found at the 25-36 in. level. The net loss in the 5 yr period in the soils of the two orchards differed by about 1% (18%, 17%) in spite of the difference in climate, soil type, and cultural practices.

72-2098. Archer, T. E.; Toscano, R. A. (Dept. Environmental Toxicol., Univ. of California, Davis, CA 95616). **Fate of Kelthane residues on apple pomace exposed to drying in the dark, sunlight, and ultraviolet light irradiation.** *Bull. Environ. Contam. Toxicol. 7(6): 353-357; 1972.* (9 references)

The fate of Kelthane (dicofol) residues applied to apples subjected to various degrees of exposure to light was investigated. The apples were sprayed with acetone containing 1.6g Kelthane/liter, air-dried, and stored at 4°C. The contaminated apples were quartered and the pomace separated from the pulp containing the juices, then divided into 3 lots. Each lot was subjected to an initial drying period with exposure to the dark, ultraviolet light, and sunlight, respectively. The samples were subsequently cross transferred to the other light treatments, with the exception of further dark drying. After plant extraction and cleanup, gas-liquid and thin-layer chromatography were applied in the analysis. The decline of Kelthane was maximum (73%) 14 days after application. The results demonstrated that the loss of Kelthane residues during apple pomace drying is mainly due to volatility rather than to photodecomposition.

72-2099. Gilbertson, M.; Reynolds, L. M. (Canadian Wildlife Service, 400 Laurier Ave., W., Ottawa, Ont., Canada). **Hexachlorobenzene (HCB) in the eggs of common terns in Hamilton Harbour, Ontario.** *Bull. Environ. Contam. Toxicol. 7(6): 371-373; 1972.* (9 references)

Hexachlorobenzene (HCB) and other organochlorine contamination in the common tern (*Sterna hirundo*) eggs is described. The eggs were collected from colonies at the western end of Lake Ontario where the terns were observed to have a low breeding success. The eggs were frozen until analyzed. The fat residue, after the drying and extraction of an egg homogenate, was analyzed by gas liquid chromatography. Confirmation of the detection of HCB was obtained through the use of columns of different polarity. Organochlorines were expressed in terms of dry weight (ppm). The mean results were: HCB – 7.67; *p,p'*-DDE 72.3; dieldrin – 4.93; and polychlorinated biphenyls – 419 ppm. Other substances found in the eggs were: TDE, other DDT derivatives, heptachlor epoxide, and mercury. It is believed that the eggs reflect the level of contamination in the small fish located near the colonies as well.

72-2100. Ivie, G. W.; Knox, J. R.; Khalifa, S.; Yamamoto, I.; Casida, J. E. (Dept of Entomol., Univ. of Kentucky, Lexington, KY). **Novel photoproducts of heptachlor epoxide, *trans*-chlordane, and *trans*-nonachlor.** *Bull. Environ. Contam. Toxicol. 7(6): 376-382; 1972.* (7 references)

The nature and toxicity of three new photoisomers obtained when heptachlor epoxide, *trans*-chlordane, and *trans*-nonachlor are exposed to sunlight is described. The procedure deposited the compounds on bean foliage in the presence of rotenone and exposed them to UV light as solutions in acetone. Toxicity tests were conducted on adult female houseflies and on male white mice. Photoalteration was estimated by gas and thin-layer chromatography. Results were obtained when groups of young bean plants were sprayed with a methanolic solution of the cyclodiene with or without rotenone. Detectable photoproducts were formed only in the presence of rotenone which acted as a photosensitizer. It was found that one of the heptachlor epoxide photoproducts is a precursor for the other. Although the first photoproduct is formed with the aid of rotenone, the second is formed only after prolonged exposure to sunlight. It was found that photo-*trans*-chlordane and photo-*trans*-nonachlor have half-cage structures. Also, the two photoisomers of heptachlor epoxide differ markedly in their toxicity to houseflies and, to a lesser extent, to mice. However, photoisomers are not expected to form in appreciable amounts in the environment unless a potent photosensitzer is present.

72-2101. Mellanby, K. (Monks Wood Experimental Station, British Nature Conservancy). **Sea pollution.** *Chem. Ind. (London) 40: 1120-1122; 1971.*

A brief overview is presented of papers given at a discussion organized by the Royal Society in 1970 which dealt specifically with the biological effects of pollution in the sea. The first three papers dealt with bioassays using fish, sea birds, and selected seaweeds, respectively. Four further papers dealt with the sublethal effects of selected pollutants, particularly pesti-

cides, sewage, and thermal pollution. A third group of papers described the effects of pollutants such as mercury, other heavy metals, (e.g. lead, copper, zinc) oil, and radioactive waste. The final group of papers dealt with pollution prevention and monitoring. It is submitted that if every pollutant could be dispersed evenly throughout the whole volume of water soon after discharge, even non-biodegradable substances such as the persistent insecticides would probably be harmless. The dangers arise due to incomplete mixing and because pollution is more intense in estuaries and offshore waters near centers of population.

72-2102. Buu-Hoi, N. P.; Saint-Ruf, G.; Bigot, P.; Mangane, M. (Equipe de Recherche CNRS no 40, Institut M. Delapine, Loiret, France). **Preparation, proprietes et identification de la 'dioxine' (tetrachloro-2,3,7,8 dibenzo-*p*-dioxine) dans les pyrolysats de defoliants a base d'acide trichloro-2,4,5 phenoxyacetique et des ses esters et des vegetaux contamines. [Preparation, properties and identification of 'dioxin' in pyrolysates of defoliants containing 2,4,5-trichloro-phenoxyacetic acid, their esters, and contaminated plants]** *C. R. Acad. Sci. Paris Ser. D, 273(7): 708-711; 1971.* (4 references) (French)

Synthesis and physical-chemical properties (obtained by high resolution mass spectroscopy) of 'dioxin' (2,3,7,8-tetrachloro-dibenzo-*p*-dioxin) and its less toxic isomer, 1,3,6,8-tetrachloro-dibenzo-*p*-dioxin, are described. By means of mass spectroscopy combined with gas chromatography, the compound can be detected and distinguished from its isomers in complex organic mixtures such as pyrolysates of 2,4,5-trichloro-phenoxyacetic acid (2,4,5-T) or its butyl ester, and in tars from combustion fumes of vegetable matter from regions treated with defoliants. Because of the presence of these compounds, the public health dangers of burning wood from areas where defoliants are used (South Vietnam) are stressed.

72-2103. Shimizu, S. (Saga Pref. Inst. for Hyg., Saga-shi, Japan). **[β-BHC residues in human milk and an attempt to reduce the residue by serving diets low in β-BHC content.]** *Nippon Koshu Eisei Zasshi (Jap. J. Pub. Health) 19(7): 376-382; 1972.* (8 references) (Japanese)

According to a study of human milk performed in 1971, the total BHC content in the milk of 20 women from Saga prefecture averaged 0.3998 ppm and the β-BHC content, 0.3775 ppm. This was 3 times the average found for Japan as a whole. β-BHC was not detectable in the blood of 13 of the women studied; the maximum β-BHC content in the blood of the other 7 women was 0.012 ppm. These high residue levels are apparently due to the large quantities of technical BHC-containing insecticides which were applied in western Japan in the past and have not yet dissipated from the soil. Dietary BHC intake was calculated for 9 days in two women with BHC contents of 0.6 ppm in their milk. The BHC level in the milk of the woman who selected a diet low in BHC content (50μg/day) was reduced by half at the end of the 9 days. That in the milk of the woman selecting a diet rich in animal products (BHC intake 100μg/day) remained unchanged.

72-2104. Terrasse, J. F.; Terrasse, M. (2, place Jean-Baillet, 92-La Garenne, France). **Contamination de mouettes Rieuses (*Larus ridibundus L.*) en Sologne par les residus organochlores. [Contamination of the mocking gull (*Larus ridibundus L.*) in Sologne with residues of chlorinated hydrocarbons.]** *Terre Vie 25(1): 76-85; 1971.* (34 references) (French)

Gas chromatographic analysis of 7 eggs collected at Sologne revealed the following amounts of residues: total chlorinated hydrocarbons, 2.20 – 26.78 ppm; hexachlorobenzene, 0.08 – 1.0 ppm; *p,p'*-DDE, 0.5 – 3.3 ppm; dieldrin, 0.06 – 0.3 ppm; polychlorinated biphenyls, 1.8 – 23.0 ppm; heptachlor epoxide: 0.14 – 1.6 ppm; lindane, 0.55 ppm (1 egg). The average weight of the shell was 1.909 g as compared to the usual weight which varies between 2.19 – 2.30 g. The average thickness of shells (3 eggs measured) was reduced by 10 – 26%. The significance of these findings and the mode of action of the pesticides in birds are briefly discussed.

72-2105. Hutzinger, O.; Safe, S.; Zitko, V. (Environ. Canada, Fisheries Services, St. Andrews, New Brunswick, Canada). **Photochemical degradation of chlorobiphenyls (PCB's).** *Environ. Health Perspect. 1: 15-20; 1972.* (15 references)

Studies on the photochemical stability of chlorobiphenyl isomers are described. The photolysis revealed a number of degradative reactions which occur after irradiation in sunlight, in a photochemical reactor, under blacklight, and under a sunlamp. In hexane the most prominent reaction was the progressive reductive dechlorination of the compounds as well as formation of polymeric materials. Irradiation in hydroxylic solvents at pH 9 yielded water-addition products and a more polar carboxylic acid fraction. Mass spectrometry of samples irradiated in a hydrated thin film revealed the presence of new hydroxylated species and a more polar 'carboxylic' fraction. The photolytic work demonstrated decomposition of PCB's by both oxidative and reductive pathways.

72-2106. Nisbet, I. C. T.; Sarofim, A. F. (Research Dept., Mass. Audubon Soc., Lincoln, MA 01773). **Rates and routes of transport of PCB's in the environment.** *Environ. Health Perspect. 1 : 21-38; 1972.* (85 references)

Because of their wide dispersal and persistence in the environment and tendency to accumulate in food chains with possible adverse effects, polychlorinated biphenyls (PCB's) give rise to general concern. The sole manufacturer of PCB's in North America is the Monsanto Company (trade name Aroclor). Current uses of PCB's are enumerated. The company has restricted sales of Aroclors based on possible contamination of food products. Routes into the environment (in North America) may occur through landfill dumps, through rivers and Great Lakes' sediments, or through attachment to sediments on the continental shelf. Transfer of PCB's may occur through: volatilization, aerial transport on particulates, and fallout; leaching from dumps; sediment transport in rivers and sea sediments; and sedimentation in the ocean. Processes by which the compounds of PCB mixtures may change after release into the environment are: fractionation (according to solubility and vapor pressure of isomers); photolytic decomposition; and metabolism and excretion. In analogy with DDT residues, PCB's in soil have a half-life of about 5 years.

72-2107. Risebrough, R. W.; De Lappe, B.* (Bodega Marine Lab., U. of Calif., P. O. Box 247, Bodega, CA 94923). **Accumulation of polychlorinated biphenyls in ecosystems.** *Environ. Health Perspect. 1 : 39-45; 1972.* (32 references)

The Monsanto Company (USA) has made public the total production figures of their Aroclor polychlorinated biphenyls (PCB's) products from 1960 through 1970 with estimated figures for production in 1971. Combined with other countries (Japan, France, Germany), a reasonable estimate for global production per year is on the order of 10^{11} grams. Measurements of PCB concentrations in the mixed layer of the ocean or in deeper waters have not yet been made; concentrations in zooplankton from the Atlantic, however, are surprisingly high. In many waste water and biological samples, the profile of PCB peaks closely matches one of the commercial preparations. Some of the reported PCB residue data in fish from representative areas of the ocean and values obtained in lake trout from an Arctic lake are tabulated. Highest concentrations were found in the fish from Tokyo Bay and from Long Island Sound. PCB residues in oceanic birds which feed on plankton and other organic material at the surface of the sea are tabulated for breeding and non-breeding areas. A summary of brown pelican egg residues in various breeding areas is presented in a table. Statistical evaluation is discussed.

72-2108. Zitko, V.; Hutzinger, O.; Choi, P. M. K. (Environ. Canada, Fisheries Res. Board, Biol. Sta., St. Andrews, New Brunswick, Canada). **Contamination of the Bay of Fundy – Gulf of Maine area with polychlorinated biphenyls, polychlorinated terphenyls, chlorinated dibenzodioxins, and dibenzofurans.** *Environ. Health Perspect. 1 : 47-50; 1972.* (7 references)

Treatment is given on the procedure for the determination of polychlorinated biphenyls (PCB's), polychlorinated terphenyls (PCT's), chlorinated dibenzodioxins, and chlorinated dibenzofurans. The procedure is based on cleanup chromatography followed by eluting various fractions and further chromatographing. PCB and chlorinated hydrocarbon pesticides in aquatic animals from the Bay of Fundy – Gulf of Maine area are tabulated. The pattern of PCB residues analyzed resembles quite closely that of Aroclor 1254. It is postulated that fish either more efficiently absorb the lower chlorinated biphenyls or preferential accumulation of higher chlorinated biphenyls occurs in the food chain.

72-2109. Veith, G. D. (Univ. of Wisconsin, Madison, WI 53706). **Recent fluctuations of chlorobiphenyls (PCB's) in the Green Bay, Wisconsin, region.** *Environ. Health Perspect. 1: 51-54; 1972.* (11 references)

Preliminary data from studies of the levels and sources of polychlorinated biphenyls (PCB's) in rivers discharging into Lake Michigan – Green Bay in northeastern Wisconsin are presented. All of the data were obtained prior to or shortly after the voluntary partial ban on PCB sales by Monsanto Company (manufacturer of PCB). Water samples were extracted with hexane. The extracts were combined, dried, and concentrated for cleanup chromatography using a Florisil column and eluted with hexane to recover PCBs. The results of the monitoring of five rivers are tabulated for 1970 and 1971. The PCB concentration in two of the major tributaries decreased sharply below the determinable limit in 1971, which suggests that the self-imposed restrictions by Monsanto Company may be having an effect. No trends in the concentration of PCBs were observed in the Fox River–the levels were found to be 0.1 μg/l (as Aroclor 1248) throughout the study.

72-2110. Fries, G. F. (U.S. Dept. of Agr., Animal Res. Div., ARS, Beltsville, MD 20705). **Polychlorinated biphenyl residues in milk of environmentally and experimentally contaminated cows.** *Environ. Health Perspect. 1: 55-59; 1972.* (9 references)

Milk tank samples were obtained from six farms with polychlorinated biphenyl (PCB) treated silos. The average concentration of PCBs in milk fat was 19.3 μg/g when the silage feeding stopped and declined to 10.3 μg/g within three weeks. First-order rate constants were calculated for a herd that was simultaneously contaminated with DDE and Aroclor 1254 from a silo; these appeared to be identical for the two compounds. Neither phenobarbital alone nor in combination with activated carbon had an effect on the relative reduction in the concentration of either compound. A controlled feeding study was conducted on nine cows fed with Aroclor 1254 for 60 days. Observations on residues in milk fat

were noted at 20 and at 60 days and in body fat at 60 days after initial feeding. The levels of PCBs are tabulated and compared to other organochlorines; a similarity to DDE is shown (Arclor 1254 = 0.20; DDE = 0.21 μg/g milk fat). No practical procedure has emerged for speeding up the elimination of PCBs from milk.

72-2111. Kuratsune, M.; Masuda, Y. (Dept. Pub. Health, Fac. of Med., Kyushu Univ. and Dept. Anal. Chem., Daiichi Coll. of Pharm. Sci., Fukuoka, Japan). **Polychlorinated biphenyls in non-carbon copy paper.** *Environ. Health Perspect. 1: 61-62; 1972.*

Non-carbon copy paper, used commonly in Japan, was examined for the presence of polychlorinated biphenyls (PCB's). The paper was extracted with acetone and the extracts analyzed by gas chromatography with an electron capture detector. The chromatograms appeared to be identical with those obtained with Kanechlor-300 (a commercial brand of PCB's) containing 43% chlorine. Infrared absorption and mass spectra analyses confirmed the presence of Kanechlor-300. In further experiments it was demonstrated that PCB's stick to the fingers when the paper is handled, and only one third of the amount sticking to the fingers can be removed by ordinary washing with soap and water. PCB's were also found in British and American non-carbon copy paper. Discontinuance of the production of this popular product is urged.

72-2112. Trout, P. E. (Container Corp. of America, Oaks, PA 19456). **PCB and the paper industry - a progress report.** *Environ. Health Perspect. 1: 63-65; 1972.* (5 references)

The finding of polychlorinated biphenyls (PCB's) in folding cartons used for packaging dried fruit caused the paper industry to search for the source of the contaminant. It was found to be in the paperstock used for the manufacture of carbonless carbon paper. The paper industry immediately adopted operating procedures that would avoid the use of this type of paper. Research is currently in progress under the sponsorship of the American Paper Institute to study the mechanism by which PCB's migrate from paperboard to food products and to survey the level of PCB's in U.S. pulps, paper, and paperboard. Cumulative distribution in 676 samples of paper and paperboard shows 94% of all samples to have PCB content less than 10 ppm; 86% less than 5ppm; and 46% less than 0.5ppm (not detectable). A second survey concerned only with recycled fiber paperboards presents preliminary data indicating a mean PCB value of 3.6 ppm and an average value of 6.4 ppm. From the migration study, preliminary data indicate a migration not higher than 33% and that PCB's in packaging do not represent a health hazard.

72-2113. Berglund, F. (Food Res. Dept., Nat. Food Admin., 104 01 Stockholm 60, Sweden). **Levels of polychlorinated biphenyls in foods in Sweden.** *Environ. Health Perspect. 1: 67-71; 1972.* (9 references)

Average levels of DDT equivalents and polychlorinated biphenyls (PCB's) in Sweden are tabulated for some marine organisms. Analyses were carried out by gas chromatography and electron-capture detection. In subsequent analyses both thin-layer and gas chromatography were used for PCB's. Levels of DDT, DDE, or PCB's above 0.1mg/kg were rarely seen in lean fish, but did occur in over half the samples with more than 4% fat in their flesh. Levels of organochlorines and the fat content of some fish found are tabulated. In other foods (meat, eggs, vegetable oils, margarine) the levels of these compounds were much lower (<0.1mg/kg). Cow's milk contained below 0.1 DDT, below 0.3 DDE, and below 0.5mg/kg fat PCB's. Butter levels were below 0.13, 0.1, and 0.1mg/kg, respectively, for these compounds. The levels in human milk were much higher; PCB levels averaged 0.5mg/kg fat. Human milk has low levels of PCB's; however, due to the high intake of milk, the suckling baby experiences the heaviest exposure.

72-2114. Price, H. A.; Welch, R. L. (Michigan Dept. of Pub. Health Pestic., Lansing, MI 48914). **Occurrence of polychlorinated biphenyls in humans.** *Environ. Health Perspect. 1: 73-78; 1972.* (18 references)

The Michigan Department of Public Health laboratories analyzed human adipose samples for organochlorine pesticides. Analytical methods used included extraction with hexane, cleanup by Florisil column chromatography, gas and thin-layer chromatography. The reference standards used were Aroclors 1260 and 1254. One sample of adipose tissue, obtained through autopsy from a subject with pulmonary thrombo embolism, contained 100ppm PCB's. More than 4000 human adipose samples were analyzed. The chromatograms of these samples did not exactly match those of the standards. Levels of 1.0ppm or more (wet weight) PCB's with isomers from Aroclors were found in 41-45% of the general population (in samples of adipose tissue). Avenues of human exposure include the food chain (through fish) and house dust.

72-2115. Yobs, A. R. (Off. of Pestic. Programs, CP, Environ. Protect. Agency, 4770 Buford Highw., Chamblee, GA 30341). **Levels of polychlorinated biphenyls in adipose tissue of the general population of the nation.** *Environ. Health Perspect. 1: 79-81; 1972.* (6 references)

Preliminary results from a monitoring program concerned with the presence of polychlorinated biphenyls (PCB's) in human adipose tissues are presented.

The samples which had been removed for therapeutic surgery or had been taken from *post-mortem* examinations were analyzed by laboratories established under contract with State Health Departments. Community study projects in Michigan, Florida, and Colorado were also involved. The monitoring laboratories revealed that positive samples were reported from 14 states. An analytical method was developed to separate the PCB's from pesticides so that accurate quantitation could be obtained. The method involved extraction by petroleum ether, acetonitrile partitioning, and Florisil cleanup. After separation, the PCB's were determined by means of thin-layer chromatography. Analytical results of 637 samples showed 31.1% to contain measurable amounts of PCB's; 19.6% contained trace amounts; the rest were negative and were representative of 38 cities in 18 states. Details of distribution by sex and race, collection procedure, and diagnostic groups are summarized.

72-2116. Kolbye, Jr., A. C. (Bur. of Foods, U.S. Food and Drug Admin., Washington, DC 20204). **Food exposures to polychlorinated biphenyls.** *Environ. Health Perspect. 1: 85-88; 1972.*

A survey conducted by the FDA on the incidence of polychlorinated biphenyls (PCB's) in the milk supply led to information offered by the Monsanto Company: large amounts of fish meal (a minor component of poultry and fish feed) were contaminated with PCB's (Aroclor 1242). The contamination was caused by a leak in the heat exchange equipment which used PCB's in the heat exchange fluid. Sampling of poultry for PCB residues revealed that no lot of broiler poultry exceeded 5ppm; eggs contained (71 out of 224) residues >0.5ppm PCB. PCB values are shown for selected food commodities. Results of packaging material analyses in connection with a total diet study (shown graphically) indicate that the PCB's found in various food commodities are the result of migration from their packaging components.

72-2117. Stalling, D. L.; Mayer, Jr., F. L. (Fish Pestic. Res. Lab., Bur. of Sport Fisheries and Wildlife, Columbia, MO 65201). **Toxicities of PCBs to fish and environmental residues.** *Environ. Health Perspect. 1: 159-164; 1972.* (28 references)

Analyses of 40 fish for polychlorinated biphenyls (PCBs) were made using sample preparation techniques to separate PCBs from pesticides and other industrial residues. These analyses employed both gas chromatography and mass spectrometry for confirmation. Only one of the 40 samples contained less than 1μg/g PCB residue. Acute experiments revealed that LC50 values decreased significantly with longer exposures and that the toxicity of PCBs to fish was inversely related to percent chlorine (higher Aroclor number). Chronic experiments revealed that coho salmon accumulated whole-body residues which were 0.9-5 times the exposure levels. Accumulation of Aroclor 1248 and 1254 by bluegills chronically exposed to 2-10μg/l was 26,300-71,400 times the exposure levels for both PCBs. Growth rates were not affected, but all fish exposed to the highest treatment died after 240 days' exposure. Thyroid activity was stimulated in all but the lowest treated group.

72-2118. Sylwester, E. P. (Iowa State Univ., Ames, IA). **Concerned about herbicide carry-over?** *Hoard's Dairyman 116(6): 352; 1972.*

All synthetically produced organic materials are subject to biological breakdown by soil organisms as well as to chemical breakdown by oxidation. Rain and leaching cause further dilution of any product. This applies to herbicides which are usually not harmful to plants in the next crop year. A carry-over may occur, however, as a result of overdosing, overlapping, the nature of the chemical itself, late application, or weather conditions. Only atrazine, simazine, and propazine have caused problems the following year. Carry-over can be avoided. The necessary precautions with respect to procedure are listed.

72-2119. Fries, G. F. (Anim. Sci. Res. Div., ARS, U.S. Dept. of Agr., Beltsville, MD). **Pesticides in your milk? What do you do when residues are found and you cannot sell your milk?** *Hoard's Dairyman 117(8): 519, 549; 1972.*

The residue level of DDT in milk fat must conform with the established tolerance levels (below 1.25 ppm). Should the milk content show excessive levels of this pesticide, it is important to trace its source and to eliminate the contaminant as quickly as possible. Investigations have shown that the level of DDT (stored in the cow's fat tissues) decreases by half approximately every seven weeks if the animal is removed from the contaminated source. A case is cited where the contamination was attributed to the soil ingested by the cows while grazing. None of the methods known to be effective with other pesticides were useful in this instance. It was found, moreover, that some heifers had also been contaminated. Since milk is the most important route through which the cow may eliminate DDT from her body, when these animals calved one year later, their milk was still contaminated. A number of rules directed at the prevention of excessive DDT in cow's milk are presented.

72-2120. Umeda, Y. (Nihon Tokushu Noyaku Seizo K. K., Japan). **Anti-blast fungicide 'Hinosan' and its biological properties and metabolism in the rice plant.** *Jap. Pestic. Inform. 10: 85-88; 1972.*

Hinosan, an organophosphorus compound developed in Japan, has both protective and curative effects against rice blast disease. It has been found effective

against sheath blight, ear blight, and stem rot. It promotes plant growth resulting in a marked increase of yield. Its active ingredient is *O*-ethyl *S,S*-diphenyl dithiophosphate. According to test results obtained by radioautography, very little translocation of ^{32}P-Hinosan and its metabolites was detected when applied to the leaves and stems of young rice seedlings; however, translocation was observed in the lower part when applied at the ripening stage. The metabolites of ^{32}P-Hinosan were observed after a lapse of time to be *O*-ethyl phosphoric acid and phosphoric acid; those with ^{35}S-Hinosan were *S,S*-diphenyl disulfide (with toluene extraction), *S*-phenyl phosphoric acid and benzene sulfonic acid (water extraction), and sulfuric acid as the final metabolite. Only those plants receiving three applications of labeled Hinosan revealed the presence of slight radioactivity. No residue was detected in hulled rice three weeks after final treatment and no residue was found in polished rice.

72-2121. Tolle, A.; Heeschen, W.; Reichmuth, J.; Kind, H. (Inst. fuer Hygiene der Bundesanstalt fuer Milchforschung, Kiel, Germany). **Trinkmilch in der Bundersrepublik Deutschland: Eine Untersuchung zum bakteriologischen, biochemischen und rueckstandsanalytischen Status. [Cow's milk in West Germany: An investigation of the bacteriological, biochemical and residue status.]** *Kiel Milchwirt. Forschungsber. 23(4): 339-456; 1971.* (51 references) (German)

In a study on the quality of cow's milk in West Germany, 1,920 milk samples were purchased from stores and dairies in 14 milk-supply regions during October 1969-February 1970 and May-July 1970. Almost 400 of these samples were studied for chlorinated hydrocarbon content by gas-liquid chromatography. The highest levels were found in the winter specimens and averaged 0.32 ppm BHC isomers (except lindane); 0.07 ppm lindane; 0.05 ppm heptachlor; 0.07 ppm heptachlor epoxide; 0.08 ppm aldrin; 0.20 ppm DDE + dieldrin; 0.19 ppm *o,p'*-DDT; 0.24 ppm *p,p'*-DDT; and 0.64 ppm total DDT. Residues of at least two pesticides were found in every sample examined. The high values found in winter implicate feed concentrates as sources of pesticide residues and point out the need for improved monitoring, especially of the imported concentrates. The 1,920 milk samples were examined for bacteriological quality and biochemical composition as well.

72-2122. Matsushima, S. (Saku Gen. Hosp., Nagano Prefecture, Japan). **[Pollution of soil and food, and cyclodienes (organochlorines).]** *Rinsho Eiyo (J. Clin. Nutr.) 39(1): 19-25; 1971.* (Japanese)

The 1970 investigations of the Ministry of Health and Welfare revealed that cucumbers, potatoes, and other agricultural products sometimes contained more than the maximum permissible quantities of aldrin, endrin, and dieldrin. Further investigations showed that although no organochlorine pesticides (cyclodienes) have been used in Japan since 1968, some produce contained considerable amounts of these compounds supplied by the residues in the soil. The endrin content in vegetables was rather high in general and an average of 0.28 ppm was detected in 30 examined products. The maximum content was 1.20 ppm. Seventy per cent of the Chinese lettuce examined and 74% of the cabbages had endrin residues. Approximately 14.3% of field soil samples contained endrin residues, the maximum being 3.921 ppm and the average 0.314 ppm. Rice paddies which had never been sprayed with endrin had 0.202 ppm of endrin; however, no aldrin and dieldrin were extracted. Much of this was caused by rain which pollutes rivers. Although water is generally not polluted by organochlorines, the riverbed sediments and fish showed considerable accumulation of these chemicals. Various residues in foodstuffs, contents in hospital diet, and the maximum permissible organochlorine content in human bodies are reviewed.

72-2123. Narafu, T. (Aichi Pref. Hyg. Res. Inst., Japan.) **[Pollution of cow's milk and human milk by BHC.]** *Rinsho Eiyo (J. Clin. Nutr.) 39(1): 26-34; 1971.* (28 references) (Japanese)

Cow's milk examined in Japan in 1970-1971, contained 0.01-1.1 ppm total BHC(mostly β-BHC) and human milk during this same period contained 0.02-0.4 ppm total BHC. Recent data show that β-BHC residues in human adipose tissue range from 10.367 to 13.561 ppm; 21.105 to 21.957 ppm in liver; and 1.334 to 0.922 ppm in brain. Dieldrin residues in human adipose tissues range from 0.392 to 0.490 ppm; 1.373 to 2.812 ppm in liver; and 0.517 to 0.486 ppm in brain. These figures are considerably higher than those in previously published data. Whether these residues influence human health directly is not certain; however, in these studies, cancerous tissues consistently showed higher levels of pesticide levels than normal tissues. Published reports indicate that β-BHC residues of up to 20.6 ppm in monkey liver (as a result of administration of 2.5mg/kg/day), up to 4.21 ppm in monkey kidneys, and up to 397.2 ppm in adipose monkey tissues have no toxic effect. These results only indicate the ambiguity of the toxicity of BHC. The questions of BHC isomer accumulation, degradation, and transfer must be studied further.

72-2124. Quentin, K. E. (Inst. fuer Wasserchemie und Chemische Balneologie der TH Muenchen, Munich, Germany). **Beurteilung und Bedeutung von Rueckstandswerten im Hinblick auf Gewaesserbiozoenose und Trinkwasserqualitaet. [Evaluation and significance of residue values from the viewpoint of the water biocenosis and drinking water quality.]** *Schriftenr. Ver.*

Wasser- Boden- Lufthyg. 34: 19-28; 1972. (9 references) (German)

It is noted that pesticide contamination of surface water must be more closely monitored in the future due to the increasing use of surface water as drinking water and to prevent irreversible damage to the biocenosis. Some general problems involved in the evaluation of pesticide residues in water are discussed. In distilled water at room temperature the parathion level dropped to 80% of the initial value within 40 days. This indicates that previous studies reporting rapid degradation at extreme pH and temperature values may not be applicable to natural conditions. More information on the degradation products of pesticides in water is needed. In many cases the acceptable limit for pesticides in water has been set by organoleptic criteria since the taste and odor threshold of many pesticides is below the acute toxicity threshold. Little is known about the additive or subtractive effects of various combinations of pesticides and other materials in surface waters. More information is definitely needed about the effects of other water quality criteria (e.g. oxygen content) on pesticide toxicity. This is related to the great fish kill on the Rhine; the low dissolved oxygen levels prevailing in this river are considered at least partially responsible, possibly by potentiating the effects of endosulfan.

72-2125. Maier-Bode, H. (Pharmakologisches Inst. der Universitaet, 53 Bonn, Germany). **Untersuchungen ueber den Insektizidgehalt von Ostseefishchen. [Studies on the insecticide content of Baltic Sea fish].** *Schriftenr. Ver. Wasser- Boden- Lufthyg. 34: 57-61; 1971.* (14 references) (German)

The finding of high organochlorine pesticide levels in the fat of fish-eating animals living on the Swedish shores of the Baltic Sea raised the question of pesticide residues in the fish caught from the Baltic by German boats. Samples consisted of: 20 frozen cod fillets (from May, 1969, catches); 4 cod livers (from November, 1969, catches); and 17 fresh fish specimens-each comprising from 1 to 22 individuals (from November, 1969, catches). All were analyzed for organochlorine content. Heads, entrails, and tails were removed from the fresh fish before analysis. The aldrin and dieldrin contents ranged from analytically undetectable quantities to only 0.02-0.03 ppm. A composite sample from the cod fillets contained 0.01 ppm DDT and 0.017 ppm DDT + DDE; the cod livers 0.04-0.09 ppm DDT and 0.05-0.15 ppm DDT + DDE; dressed fresh cod 0.005-0.04 ppm DDT and 0.025-0.11 ppm DDT + DDE; dressed fresh flounder, 0.005-0.21 ppm DDT and 0.009-0.36 ppm DDT + DDE; herring, 0.02-0.08 ppm DDT and 0.04-0.10 ppm DDT + DDE; salmon, 0.08 ppm DDT and 0.016 ppm DDT + DDE. Since these values are considerably below the tolerances for DDT and DDE in fruits and vegetables, they seem to represent little threat to the German consumer.

72-2126. Beynon, K. I. (Anal. Chem. Div., Shell Res. Ltd., Woodstock Agr. Res. Centre, Sittingbourne, Kent, England). **The fate and effects of Frescon molluscicide in aquatic systems.** *Schriftenr. Ver. Wasser- Boden- Lufthyg. 34: 95-107; 1971.* (10 references)

Frescon is applied to water and land areas for control of molluscs (most *Basommatophorae* and a few *Prosobranchiatae*), some of which serve as vectors for bilharzia and other diseases. Frescon hydrolyzed in water forms triphenylcarbinol at a rate dependent on the pH of the water. Both Frescon and its metabolite absorb onto mud and sediments. Breakdown of Frescon in soil occurs within a few weeks under aerobic conditions. Triphenylcarbinol in turn is converted to hydroxylated derivatives, presumably by soil microorganisms. Rice grown in soil containing 0.02 ppm Frescon had Frescon levels of 0.01 ppm in stem and leaves and 0.05 ppm in the rice grain. The triphenylcarbinol level in soil at harvest time (2 wk after Frescon application) was 0.5 ppm; in rice stem and leaves, 3.0 ppm; and in rice grain, 0.9 ppm. Small quantities of other derivatives were present. Fish took up increasing amounts of the Frescon applied to water with continued exposure. This effect might have been due to adsorption of the molluscicide on the sediment which adhered to the fish gills. In mammals Frescon is metabolized as a mixture of triphenylcarbinol and morpholine. Frescon is not toxic to plants or to most invertebrates with the exception of molluscs and some leeches. Fish toxicity varies with species. In a field trial where 0.025 ppm of Frescon was applied to a pond, some sticklebacks died, but no trout.

72-2127. Whitacre, D. M.; Roan, C. C.; Ware, G. W. (Dept. of Entomol., Univ. of Arizona, Tucson, AZ). **Pesticides and aquatic micro-organisms.** *Search 3(5): 150-157; 1972.* (78 references)

The effects of pesticides on growth and survival of fresh water micro-organisms and microscopic plants and animals are reviewed. The very high surface mass ratio for micro-organisms and the low solubility of pesticides are mainly responsible for their rapid and thorough absorption from the aquatic environment. Sources of pesticides include intentional introduction; e.g., pest control of objectionable flora and fauna, industrial wastes and other wastes and unintentional introduction such as drift from pesticide applications or irrigation of soil water. A review of pesticide toxicity includes direct effects on growth rate, reproduction, and changes in specific metabolic rates (photosynthesis). In addition lethal effects of the chemical on particular organisms are given. Pesticides reviewed comprise herbicides, insecticides (organochlorines, organophosphates), and fungicides. The relative toxicities of pesticides to *Daphnia* are listed in terms of 48-hr LC50 in ppm. Concentrations of freshwater and marine microorganisms are discussed. The summary of the metabolism of pesticides refers to to many reviews.

72-2128. Daly, R. W. (Auburn Univ., Auburn, GA). **Degradation of 2,4-DBEE in an aquatic environment.** *Diss. Abstr. Int. 32(7): 3806-B; 1972.*

Ultraviolet light produced 50% 2,4-DBEE (butoxyethyl-2,4-dichlorophenoxyacetate) degradation in 12 hours. Formation of volatile products was observed in all UV treated ester and 2,4-D solutions. The ethyl ester of 2,4-D was recovered from the butoxyethanol ester study. Several other unknowns were collected from the butoxyethanol ester and 2,4-D UV studies, but they were not identified. Absorption and translocation of 2,4-DBEE and 2,4-D by milfoil was observed following root and shoot treatments. Acropetal and basipetal translocation was found as well as extensive root and shoot leakage into non-treated solutions. Absorption of the ester was three times greater than the acid. Systems using living material, pond water, polluted water, and water containing 25 g milfoil completely degraded supplied 2,4-DBEE to 2,4-D in 24 hours. All systems produced $^{14}CO_2$, polluted water producing the most. More $^{14}CO_2$ was produced from 2,4-DBEE-1-^{14}C and 2,4-D-1-^{14}C than from 2,4-D-2-^{14}C and uniformly ring labeled 2,4-D. Several unknown metabolites were recovered. The major unidentified metabolites obtained from the absorption-translocation and living material degradation studies were judged identical. Acid hydrolysis of the unidentified metabolites produced 2,4-D indicating a complex, tentatively identified as a possible carbohydrate complex. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-2207).

72-2129. Joiner, R. L. (Mississippi State Univ., State College, MS). **A study of the photoalteration products of parathion.** *Diss. Abstr. Int. 32(7): 4169-4170B; 1972.*

Fifteen photoalteration products of parathion were chromatographically separated by thin-layer chromatography. Twelve of these products were identified and confirmed by infrared spectroscopy. One product, ethyl paraoxon, was of equal toxicity to the boll weevil as ethyl parathion, but methyl parathion and methyl paraoxon were about 3 times as toxic as their ethyl analogs to the same insect. Acetylcholinesterase studies indicated that *S*-ethyl parathion, *S*-phenyl parathion, paraoxon, ethyl bis(*p*-nitrophenyl) phosphate, and ethyl bis(*p*-nitrophenyl) phosphorothioate were significantly greater anticholinesterase agents to the boll weevil, golden shiner, and white rat than the parent compound. Of the 12 products identified, 7 had not been implicated previously: *p*-aminophenol, diethyl phenyl phosphate, diethyl phenyl phosphorothioate, ethyl bis(*p*-nitrophenyl) phosphate, ethyl bis(*p*-nitrophenyl) phosphorothioate, diethyl phosphate, and monoethyl phosphate. ^{14}C-parathion was applied on a weekly basis to individual leaves of cotton plants in 4 environmental situations: environmental growth chamber, green house, precipitation-controlled field, and open field. Samples were collected one week after application and analyzed for the total radioactivity remaining and the radioactive photoalteration products formed. A new column chromatographic cleanup procedure was developed for the separation of the photoalteration products of parathion and the pigments present in cotton leaves. Parathion was found to be much more persistent on cotton leaves than had been reported previously. As much as 20.5% of the ^{14}C-parathion applied remained after 7 days, and up to 15.4% was found after 28 days. Of the remaining radioactivity, 52-82% was identified as unchanged parathion and 17.5-30% as paraoxon. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-4369)

72-2130. Gutenmann, W. H.; Greenwood, R. A.; Gyrisco, G. G.; Little, R. J. (Dept. of Entomol., Cornell Univ. Ithaca, NY 14850). **Studies of aldrin and chlordane in silt loam soils and their possible translocation in field corn in New York.** *J. Econ. Entomol. 65(3): 842-844; 1972.* (5 references)

Chlordane and aldrin at 2, 4, or 6 pounds per acre were applied as emulsion sprays to a silt loam soil in central New York. Immediately following treatments, all plots were disced to a depth of 4-6 inches. 'Pioneer 377' field corn when grown on the treated soils failed to show at harvest any residues of the insecticides from any portion of the plant in excess of that on the untreated checks. (Author abstract by permission)

72-2131. Mosher, D. R.; Kadoum, A. M. (Dept. of Entomol., Kansas State Univ., Manhattan, KS 66502). **Effects of four lights on malathion residues on glass beads, sorghum grain, and wheat grain.** *J. Econ. Entomol. 65(3): 847-850; 1972.* (11 references)

Different regions of light have different photodegradative effects on malathion deposits on glass beads, sorghum grain, and wheat grain. Temperature effects of IR light produced the most rapid disappearance of malathion, whereas far UV light, plant GRO, and near UV light exhibited a decreasing order of photodegradative activity. Identified degradation products of malathion were: malaoxon, malathion monoacid, malathion diacid, *O*-demethyl malathion, *O,O*-dimethyl phosphorodithioate, *O,O*-dimethyl phosphorothioate, dimethyl phosphate, and phosphoric acid. Several unidentified compounds, both thiophosphates and phosphates also were detected. (Author abstract by permission)

72-2132. Lindquist, R. K.; Krueger, H. R.; Spadafora, R. R.; Mason, J. F. (Dept. of Entomol., Ohio Agr. Res. and Dev. Cent., Wooster, OH). **Application of aldicarb to greenhouse tomatoes: plant growth, fruit yields, greenhouse whitefly control, and residues in fruits.** *J. Econ. Entomol. 65(3): 862-864; 1972.* (4 references)

Aldicarb 10 G was applied to greenhouse tomato

seedlings in 10-cm diameter peat pots at 0.25 and 0.5 g of formulation per pot. Eight days after treatment, seedlings were placed in a soil bed and grown following normal commercial production practices. Both treatment rates provided good control of *Trialeurodes vaporariorum* (Westwood) for 10 weeks. Plant growth was not affected, and no significant differences in fruit yields were obtained, compared with untreated plants. Residues in tomato fruits were measured 78, 84, and 98 days following treatment, and averaged 0.025, 0.014, and 0.010 ppm, respectively, for the 0.25-g application rate. (Author abstract by permission)

72-2133. Ward, C. R.; Owens, J. C.; Turner, W. E. (Entomol. Sect., Texas Tech Univ., Lubbock, TX 79409). **Residues of diazinon remaining after application to wheat.** *J. Econ. Entomol. 65(3): 899; 1972.* (1 reference)

Diazinon was applied once to a non-irrigated field of winter wheat near Lubbock, Texas at 0.25 or 0.5 lb/acre on Dec. 16, 1968. The wheat was in vigorous growth at the time of application, and was 3-6 in. high. Samples consisted of 2 lb of whole plants excised at ground level. Residues in plants treated with diazinon at the lower application rate declined from 2.60 ppm 3 days after treatment to 0.79 ppm after 7 days, 0.16 ppm after 28 days, and $<$ 0.05 ppm in foliage or grain after 165 days. At the 0.5 lb/acre application rate, the foliage contained 8.30 ppm diazinon after 3 days, 1.90 ppm after 7 days, 0.31 ppm after 28 days, and $<$ 0.05 ppm (grain or foliage) after 165 days, thus at the time of harvest.

72-2134. Addison, R. F.; Zinck, M. E.; Ackman, R. G. (Fisheries Res. Board of Canada, Marine Ecol. Lab., Bedford Inst., Dartmouth, N. S., Canada). **Residues of organochlorine pesticides and polychlorinated biphenyls in some commercially produced Canadian marine oils.** *J. Fish. Res. Board Canada 29(4): 349-355; 1972.* (27 references)

Herring oils produced in the late 1960s from Gulf of St. Lawrence fish generally contained 7-17 ppm DDT complex, 0.1 ppm dieldrin, and up to 11 ppm PCBs. In spring, oils were richer in residues than in autumn. Seal oils contained up to 8 ppm DDT complex, and about 4 ppm PCBs, but no dieldrin. Residue levels showed no marked change from the mid-1950s to mid-1960s. North Atlantic whale oils contained up to 40 ppm DDT complex, and (in a few samples only) about 7 ppm PCBs; no dieldrin was found. Some Antarctic whale oils produced about 1950 contained 0.1 ppm DDT complex and no detectable PCBs. (Author abstract by permission)

72-2135. Edmundson, W. F.; Frazier, D. E.; Maceo, A. (Community Stud. on Pestic., Dade County, FL). **Sequential biochemical tests in persons taking PH phenytoin.** *Ind. Med. 41(4): 7-11; 1972.* (7 references)

Among 14 volunteers taking phenytoin (diphenylhydantoin) 100 mg t.i.d. for six months in an investigation of its depesticidation effects, the only notable finding from biochemical testing was a substantial increase (+67.8%) in alkaline phosphatase at three months; 13 of 14 men had abnormal values (>82 mU/ml). At six months, the alkaline phosphatase receded (+7.1%), while dosage of the anticonvulsant drug remained the same. In these same individuals, serum glutamic oxaloacetic transaminase slowly increased but generally stayed within normal limits (>55 mU/ml). Simultaneous testing of total protein, serum albumin, and lactic dehydrogenase produced no evidence of hepatoxicity. No remarkable changes occurred in other biochemical parameters, hemoglobin or hematocrit. Since previous studies indicated that an appreciable decrease in blood and tissue DDT and dieldrin levels occurs when diphenylhydantoin is administered at this dosage, the safety demonstrated in the present tests suggests that diphenylhydantoin could be used for pesticide residue removal from humans. The depesticidation effect is presumably attributable to hepatic microsomal enzyme induction. (Author abstract by permission, edited)

72-2136. Morgan, K. J.; Zabik, M. E.; Funk, K. (Dept of Food Sci. and Human Nutr., Michigan State Univ., E. Lansing, MI 48823). **Lindane, dieldrin and DDT residues in raw and cooked chicken and chicken broth.** *Poultry Sci. 51(2): 470-475; 1972.*

The levels of lindane, dieldrin, DDT, DDE, and DDD in meat and broth from selected parts of hens cooked by simmering and pressure cooking were compared to the levels in the raw meat. Both cooking methods resulted in similar levels of pesticide reduction. By comparing total pesticide residue levels in raw and cooked tissue as well as broth, it was found that 2/5 of the lindane and approximately 3/4 of the dieldrin and total DDT compounds were recovered in the cooked meat and broth. Of these levels, the broth accounted for 2/5 and 4/5 of all the pesticides recovered except for DDD where 3/5 of the converted isomer was retained in the meat. Therefore, discarding the broth and drippings after cooking pesticide contaminated hens could greatly reduce the level of pesticide consumption. (Author abstract by permission)

72-2137. Koren, E. (Div. of Weed Res., P.O.B. 6, Bet Dagan, Israel). **Leaching of trifluralin and oryzalin in soil with three surfactants.** *Weed Sci. 20(3): 230-232; 1972.* (7 references)

The leaching of *α,α,α*-trifluoro-2,6-dinitro-*N,N*-dipropyl-*p*-toluidine (trifluralin) and 3,5-dinitro-N^4,N^4-dipropyl-sulfanilamide (oryzalin) with and without surfactants was studied in soil columns. In dry soil without surfactants leaching of trifluralin was less than that of oryzalin and did not amount to more than a few

centimeters despite the use of light soil and large amounts of herbicide. In wet soil trifluralin leached more than twice as deep as in dry soil with the same amount of water. The addition of surfactants at a concentration of 2% of the spray volume increased both depth of water penetration and herbicide movement into the soil. The most pronounced effect of surfactants was the increase in movement of trifluralin in dry soil, but they also increased trifluralin movement in wet soil. There was no direct relationship between the ability of the surfactants to improve water penetration and their effects on leaching of the two herbicides. It was therefore concluded that increased leaching was due to an effect of surfactants on the sorption-desorption balance rather than on improved penetration of water. The improved movement of trifluralin into the soil as a result of surfactant action was also evident from another experiment in which surfactants increased the herbicidal activity of trifluralin sprayed preemergence on the soil surface. (Author abstract by permission)

72-2138. McCall, H. G.; Bovey, R. W.; McCully, M. G.; Merkle, M. G. (Dept of Range Sci., Texas A & M Univ., College Station, TX 77843). **Adsorption and desorption of picloram, trifluralin, and paraquat by ionic and nonionic exchange resins.** *Weed Sci. 20(3): 250-255; 1972.* (28 references)

We investigated the forces involved in the adsorption and desorption of 4-amino-3,5-6-trichloropicolinic acid (picloram), 1,1′-dimethyl-4,4′-bipyridinium ion (paraquat), and α,α,α-trifluoro-2,6-dinitro-*N*,*N*-dipropyl-*p*-toluidine (trifluralin) using cationic, anionic, and nonionic exchange resins. The anionic resin (Cl-form) adsorbed 375, 0.08, and 0.67 mg of picloram, paraquat, and trifluralin, respectively, per gram of oven-dry resin. The nonionic resin adsorbed 4.0, 0.34, and 10.0 mg of picloram, paraquat, and trifluralin, respectively, per gram of oven-dry resin, while the cationic resin (H-form) adsorbed 2.3, 226, and 0.17 mg of picloram, paraquat, and trifluralin, respectively. Other cationic resins (Na-form and Ca-form) performed similarly to the hydrogen form. Desorption studies indicated that picloram was adsorbed mainly in the anionic form by coulombic forces (electrostatic) and to a lesser degree by weak physical bonding (van der Waal's forces). Paraquat was adsorbed as a cation through coulombic forces. Trifluralin was mainly absorbed by physical bonds at sites on the resins where there were no coulombic forces. (Author abstract by permission)

72-2139. Davis, F. S.; Meyer, R. E.; Baur, J. R.; Bovey, R. W. (Dept. of Range Sci., Texas A & M Univ., College Station, TX 77843). **Herbicide concentrations in honey mesquite phloem.** *Weed Sci. 20(3): 264-267; 1972.* (6 references)

Herbicide content in honey mesquite (*Prosopis juliflora* (Swartz) DC. var. *glandulosa* (Torr.) Cockerell) phloem 48 hr after treatment was higher in stems within 20 cm of the foliage than in those near the soil line. Similar levels of (2,4,5-trichlorophenoxy)acetic acid (2,4,5-T) occurred from applications of either 0.56 or 1.12 kg/ha, whereas three times as much 4-amino-3,5,6-trichloropicolinic acid (picloram) occurred in plants sprayed with the high rate than in those sprayed with the low rate. Herbicide concentration was highest in June and lowest in August. (Author abstract by permission)

See also 72-2041 72-2042 72-2047 72-2048 72-2049 72-2055 72-2057 72-2060 72-2067 72-2-76 72-2232 72-2254 72-2256 72-2264

72-2140. Bank, W. J.; Pleasure, D. E.; Suzuki, K.; Nigro, M.; Katz, R. (Dept. of Neurol., Univ. of Pa. Sch. of Med., Philadelphia, PA 19104). **Thallium poisoning.** *Arch. Neurol. 26(5): 456-464; 1972.* (35 references)

Case histories of five persons with thallium intoxication are presented. Two cases involved children who ate a rodenticidal cookie; one case was a suicide attempt; the source of thallium in the remaining cases was unknown. In four of the cases the diagnosis was not made until alopecia developed between two and four weeks after the initial neurological symptoms and after various degrees of impairment of consciousness developed. Pain in the limbs, particularly the legs, was the primary symptom in the cases. Two of the patients had early gastrointestinal symptoms of nausea, vomiting, and bloody stools. Two patients developed ophthalmic abnormalities. Autonomic symptoms of tachycardia and hypertension occurred. A sural nerve biopsy taken in one case revealed degeneration of the myelin sheath with myelin figures and granular material within the sheaths. Axonal fragmentation occurred. Positive identification of thallium was obtained from urine specimens screened in a test employing Rhodamine B in three of the cases. Administration of potassium ion in two cases increased thallium excretion, but also intensified subjective symptoms. Only symptomatic treatment was given in one case and the patient recovered. In another case, belated administration of dimercaprol and ammonium dithiocarbamate increased urinary thallium excretion; however, the patient died following respiratory arrest 74 days after the onset of coma. Exchange tranfusions and chelation resulted in recovery in another case.

72-2141. Gress, F.; Risebrough, R. W.; Sibley, F. C. (Bodega Marine Lab., P. O. Box 247, Bodega Bay, CA 94923). **Shell thinning in eggs of the common murre, *Uria aalge*, from the Farallon Islands, California.** *Condor 73(3): 368-369; 1971.* (11 references)

Five murre eggs collected on the Farallon Islands in 1968 were examined for shell thickness, shell weight, and shell thickness index. The values obtained were compared with those of 66 eggs collected in 1913 from the same species and location. The more recent eggs were found to have significantly thinner shells and lower shell weights and shell thickness indices. Examination of an additional 24 eggs collected in 1970 confirmed the changes in these parameters; length and breadth measurements did not so differ. Thickness decreased (of 1913 eggs) by 12.8%, thickness index by 11.9%, and shell weight by 11.5%. Lipid extracts of the recent eggs contained an average of 297 ppm DDE, 168 ppm polychlorinated biphenyls (PCB), and 0.021 ppm dieldrin. Hatchability of eggs may be affected by a decrease in shell thickness.

72-2142. Newell, R. C. (Dept. of Zool., Queen Mary Coll., London, England). **The effect of chemical waste on marine organisms.** *Effluent Water Treat. J. 119(7): 307-311; 1972.* (16 references)

Zones of acute toxicity due to industrial effluents discharged into the sea are defined. The methods used in toxicity studies included the exposure of test organisms to samples of effluents and comparison of the mortality rate to that of similar organisms in uncontaminated seawater. Graphs showing the mortality percentage in toxic substances for both the mussel *Mytilus edulis* and the crab *Carcinus maenas* illustrate the tests. Some of the problems emerging from the evaluations are evinced. However, when hydrographic details are combined with experimental data on the effluent, prediction of the zone of acute toxicity is possible. Additional information is given on the discharge of a concentration of persistent toxins, which may reach harmful levels, into the sea. These toxins include chlorinated hydrocarbons used as insecticides, polychlorinated biphenyls, and the salts of heavy metals. Cumulative effects in the food chains represent the most immediate danger.

72-2143. Kuratsune, M.; Yoshimura, T.; Matsuzaka, J.; Yamaguchi, A. (Dept. of Pub. Health, Fac. of Med., Kyushu Univ., Fukuoka, Japan). **Epidemiologic study on Yusho, a poisoning caused by ingestion of rice oil contaminated with a commercial brand of polychlorinated biphenyls.** *Environ. Health Perspec. 1: 119-128; 1972.* (21 references)

Results of an epidemiologic study are described. The study was prompted by the outbreak of a disease (Yusho) associated with the ingestion of rice oil which was contaminated by a commercial brand (Kanechlor) of polychlorinated biphenyls (PCB's). Clinical symptoms included eye discharge, skin eruption, edema, and general lassitude. A distinct familial aggregation was detected among the victims. It was discovered that all the patients had used the same brand of K oil produced and shipped on Feb. 5-6, 1968. An attack rate as high as 63.9% was noted for those who consumed this specific brand. Detailed investigations regarding other similarities between the patients led to the conclusion that the responsible factor for the disease was the oil. Gas chromatographic analysis of oil shipped Feb. 7-10 (since original samples were not available) revealed a contamination with PCB's at 2,000-3,000ppm. The Kanechlor had been used in the heating equipment and apparently leaked into the oil. After the lapse of three years, many patients with Yusho are still suffering effects. Babies born to affected parents are under observation.

72-2144. Kuratsune, M. (Dept. of Pub. Health, Fac. of Med., Kyushu Univ., Fukuoka, Japan). **An abstract of results of laboratory examinations of patients with Yusho and of animal experiments.** *Environ. Health Perspect. 1: 129-136; 1972.* (22 references)

Laboratory results are presented in tabular form

covering the findings on patients with Yusho. The Yusho was contracted by subjects who have used rice oil accidentally contaminated in the oil processing plant. The first table gives the findings in terms of blood hematology, lipids, proteins, electrolytes, enzymes, and liver function. Urinary analysis includes evidences of proteins, glucose, urobilinogen, steroids, and amino acids. Fatty acid values are shown for acne and skin fat; liver and skin biopsies are described; neurological and otorhinolaryngological findings and ocular signs are noted. Also included are results of animal experiments conducted to study the effects of a contaminant (Kanechlor) containing polychlorinated biphenyls. The animal experiments are tabulated under the type of experiment (dosage and administration route) and results.

72-2145. Suga, K. (Sch. of Ophthalmol., Fac. of Med., Mie Prefectural Univ., Tsu-shi, Japan). **[Environmental pollution and eye damage.]** *Ganka Rinsho Iho (Jap. Rev. Clin. Ophthalmol.) 66(6): 537-539; 1972.* (4 references) (Japanese)

The relationship of environmental pollution to visual impairment in man through use of pesticides, air pollutants, plastic tableware, and water pollutants is discussed. Pesticide categories incriminated include antibiotics, organochlorines, organophosphates, and organomercurials. It was found that the agricultural antibiotics blasticidin-S (rice-blast fungicide) and streptomycin caused blepharitis, conjunctival hyperemia, and corneal damage if splashed into the eye during application; kasugamycin and polyoxin do not cause such impairments. The organochlorine compound NIP (2,4-dichlorophenyl-4′-nitrophenyl ether) has been reported to cause conjunctival irritation and corneal opacity as well as conjunctival granulation. Difolatan has reportedly caused tenonitis. According to some authors, the so-called Saku eye disease is attributable to organophosphorus pesticides. Principal symptoms of this disease are visual impairment, myopia due both to contraction of the muscles responsible for accomodation and elongation of the optical axis, narrowing of the peripheral visual field with normal ERG, paralysis of eye muscles due to continuous stimulation, nystagmus, and miosis or mydriasis. Occurrence of astigmatism is debated. The fundus is reddened in the area of the optic nerve and the retina has a tigroid appearance. Treatment includes pralidoxime, padrin, and thiola. A mercurial pesticide, phenylmercuric acetate, can cause the Hunter-Russell syndrome with narrowing of the visual field.

72-2146. Lisella, F. S. (Div. of Pestic. Community Studies, Environ. Protect. Agency, Chamblee, GA 30341). **Epidemiology of poisoning by chemicals.** *J. Environ. Health 34(6): 603-612; 1972.* (55 references)

Accidental poisonings (generally in children) by means of common chemicals usually found in most households are described. Concern about these problems in the United States prompted the creation of Poison Control Centers, the general purpose of the centers being to minimize the danger of toxic substances by improving efforts for the prevention and treatment of poisoning. Scientific papers dealing with epidemiologic analyses are reviewed. Figures on pesticide mortality (in the U.S.) are quoted and a table is presented showing the number of poisonings and of some resulting deaths due to various pesticides in the years 1968 through 1970. Prevention of accidental poisoning may be achieved in various ways, including precautionary labeling, producing tablets which are unattractive to children (dark colors), producing dispensing devices that cannot be easily opened by children, and parents' refraining from taking medicine in the presence of their children. Various aspects of self-poisoning are discussed.

72-2147. Guenther, R.; Doenhardt, A.; Altland, K.; Jensen, M.; Goedde, H. W. (Allgemeines Krankenhaus Hamburg-Barmbek, II. Medizinische Abteilung, Hamburg, Germany). **Alkylphosphatintoxikation. Kasuistik einer schweren Vergiftung und Anwendung eines gereinigten menschlichen Cholinesterasepraeparats. [Alkyl phosphate poisoning. History of a severe case, and the use of a purified human cholinesterase preparation.]** *Med. Klin. 66(21): 785-788; 1972.* (8 references) (German)

After drinking large quantities of alcohol and 25 ml of concentrated parathion solution, the 49-year-old patient was brought to the hospital in a somnolent condition with convulsions and severe cyanosis. He was immediately given 0.5 g PAM and 250 mg toxogonin and started on injections of 1 mg atropine every 15 min. During the next 20 days, any attempt to reduce the atropine dosage was followed by an impairment in general condition, including respiration and blood pressure. Continuous respiratory assistance was required. Injections of 140 mg of purified human cholinesterase were administered on days 22, 23, and 28 after poisoning. Although their purpose was primarily diagnostic (to determine whether a cholinesterase inhibitor was still present in the blood), they also seemed to possess considerable therapeutic value. Whereas the first two injections were followed by sharp drops in cholinesterase activity, the total serum cholinesterase gradually rose toward normal after the third injection. Although no active cholinesterase inhibitor could be detected in the patient's blood serum, continuous release of parathion or an active metabolite from tissue depots offers the most plausible explanation for the continued cholinesterase depression.

72-2148. Nishikawa, S. (Tokyo Univ., Sch. Med); Tokyo, Japan). **[Human hereditary pollution in public health.]** *Nihon Univ. Med. J. 30(10): 799-803; 1971.* (22 references) (Japanese)

Various chemical and physical factors damaging

chromosomes are reviewed. Factors examined include natural foods, food additives, pharmaceuticals, air pollutants, water pollutants, pesticides and herbicides, alkylating agents, antimitotic agents, inorganic chemicals, and physical factors. Although the effects of pesticides on chromosomes have been studied, relatively little is known. Captan is known to damage chromosomes in cultured lung cells. Alkylating agents, used as insect chemosterilants, are known to cause damage to cultured lymph cells; however, they are also used as anti-leukemia and anti-cancer agents. No damage to chromosomes by DDT has been reported. Maleic hydrazide is known to cause chromosome mutations in cultured mouse fibroblasts.

72-2149. Ishikawa, S. (Sch. of Ophthalmol, Fac. of Med., Kitasato Univ., Minato-ku Tokyo, Japan). **[Diagnostic criteria of chronic organophosphate (pesticide) poisoning.]** *Nippon Ganka Kiyo (Folia Ophthalmol. Japon.) 23(7): 569-583; 1972.* (347 references) (Japanese)

Ophthalmologic disturbances presumably attributable to organophosphate pesticide exposure, especially in primary school children, were first reported in 1969. Many cases may have gone unreported due to the difficulty in detecting this syndrome. A screening program is currently being set up in Japan and will consist of a two-phase examination. The first phase will be carried out by trained nurses, teachers, or visiting testers. The criteria will be: impaired vision; impaired sense of balance; poor physical performance; restlessness in class or at play; poor weight gain. Children with positive results in all of these criteria will be further screened by experienced ophthalmologists. Second-stage criteria include: impaired vision; narrowing of the visual field; myopia; severe bilateral astigmatism; impairment of balance; accentuation of patellar reflex; low cholinesterase activity; therapeutic effectiveness of pralidoxime or padrin administration. Children giving positive results in five of these eight criteria are diagnosed as having chronic organophosphate poisoning. Another series of eight criteria can be regarded as confirmatory.

72-2150. Conney, A. H.; Welch, R.; Kuntzman, R.; Chang, R.; Jacobson, M.; Munro-Faure, A. D.; Peck, A. W.; Bye, A ; Poland, A.; Poppers, P. J.; Finster, M.; Wolff, J. A. (The Wellcome Res. Labs., Burroughs Wellcome and Co. (U.S.A.) Inc., Tuckahoe, NY). **Effects of environmental chemicals on the metabolism of drugs, carcinogens, and normal body constituents in man.** *Ann. N. Y. Acad. Sci. 179: 155-172; 1971.* (98 references)

The effects are presented of some environmental chemicals on microsomal function in man. People with prolonged occupational exposure to large amounts of DDT were found to have a decreased serum half-life of phenylbutazone and an increased urinary excretion of 6β-hydroxycortisol. However, no correlation existed between the rate of phenylbutazone disappearance and the excretion of 6β-hydroxycortisol in the urine. The results of this study indicated that hydroxylation of these two compounds is under separate regulatory control and that DDT does not enhance to any significant extent the activity of liver microsomal enzymes in man. Another study revealed that pretreatment of rats with a high dose of piperonyl butoxide markedly inhibited the total body metabolism of antipyrine; the mouse was more affected. The oral administration of 50 mg of piperonyl butoxide did not influence antipyrine metabolism in man. Several polycyclic aromatic hydrocarbons present in cigarette smoke were tested for ability to induce benzpyrene hydroxylase activity in rat placenta. The results are tabulated.

72-2151. Bledsoe, F. H.; Seymour, E. Q. (111 Pimlico Road, Greenville, SC 29607). **Acute pulmonary edema associated with parathion poisoning.** *Radiology 103(1): 53-56; 1972.* (16 references)

Acute parathion intoxication in three young boys is described; the major roentgenographic finding in each case was pulmonary edema. Parathion is rapidly absorbed through the skin and mucous membranes and from the respiratory and gastrointestinal tracts. The toxic effects of the organic phosphate compounds are related to their ability to inhibit cholinesterase. The excessive cholinergic activity can be due either to muscarinic, nicotinic, or central nervous system effects. Pulmonary edema is mainly ascribed to the muscarinic effect of the pesticide; hypoxia has been suggested as a possible contributing factor. The clinical course of parathion poisoning is rapid; early diagnosis and treatment may be life-saving. The radiographic changes of the pulmonary edema associated with parathion toxicity resolve rapidly with appropriate treatment.

72-2152. Hiraki, K.; Iwasaki, I.; Namba, M. (Sch. of Internal Med., Fac. of Med., Okayama Univ., Okayama, Japan). **[Electroencephalograms in pesticide poisoning cases.]** *Rinsho Noha (Clin. Electroencephalog.) 14(6): 333-340; 1972.* (27 references) (Japanese)

General aspects of pesticide intoxication and therapy have been reported previously. Since most pesticides act on the nervous system, appreciable pathological alterations can be produced there, especially in the CNS. Four cases of pesticide intoxication are described: one with endrin, two with ceresin[!] (*O*-methyl *O*-cyclohexyl *S*(*p*-chlorophenyl)thiophosphate), and one with Nissol (MNFA). The EEG changes in ceresin poisoning differed from those generally encountered in organophosphate poisoning. These two patients had sharp, high-voltage θ-waves of 6-7 c/s, and irregular α-waves of 8-9 c/sec as base waves. When tested for forced hyperventilation, one case showed the continuous appearance of θ-waves of 4-5 c/s, whereas the other (milder) case showed a paroxysmal intervening slow wave. In both

cases the EEG returned practically to normal before the clinical symptoms disappeared or the ChE activity normalized. In the MNFA intoxication case the patient's condition was serious with unconsiousness and a very low blood sugar value (50 mg/dl). The EEGs recorded on the first and seventh days of hospitalization showed flat, low-voltage waves without any slow waves or spikes. Intravenous administration of 40 ml of 40% glucose solution restored the α-waves, although at low voltage, and the EEG returned to normal after one month. The EEG of the patient poisoned with endrin showed marked fluctuations of α- and β-waves, and dysrhythmia at 8-10 c/s.

72-2153. Matueda, S.; Mikami, M.; Ohtaki, Y.; Kudo, N. (Fac. of Culture, Hirosaki Univ., Hirosaki-shi, Japan). **[Relationship between blood glutathione and cholinesterase activity in methyl parathion poisoning.]** *Seikagaku (Biochemistry) 44(7): 299-302; 1972.* (22 references) (Japanese)

A reduced glutathione (GSH) dependent enzyme system found in a supernatant fraction of rat liver homogenate mediates the demethylation (detoxication) of *O,O*-dimethyl phosphate or phosphorothioate insecticides such as methyl parathion, methyl paraoxon, and fenitrothion, this system has been designated glutathione-*S*-transferase. Intravenous administration of GSH to a patient with acute methyl parathion poisoning resulted in a dose-dependent restoration of the serum and erythrocyte cholinesterase activities. Despite the predictable depression of serum cholinesterase activity which occurred in cases of organophosphate poisoning, no observable difference in total blood glutathione activity existed between normal persons and poisoning victims.

72-2154. Ishikawa, T. (Sch. of Ophthalmol., Fac. of Med., Kitazato Univ., Tokyo, Japan). **[Pictorial presentation on organophosphate pesticide intoxication.]** *Shinryo To Hoken (Clin. Med.) 14(7): 8-13; 1972.* (Japanese)

A pictorial presentation on organophosphate intoxication includes graphs, photographs, and photomicrographs dealing with organophosphate utilization and clinical signs of intoxication. Japan has one of the world's highest rates of utilization of organophosphate pesticides per unit area and a correspondingly large number of poisoning cases each year. Organophosphate intoxication causes disorders throughout the body including nervous system symptoms such as abnormal reflexes, losses of sensation, poor balance, and abnormal EEG and EMG, in addition to psychic disorders, muscular atrophy, and autonomic disorders. Cholinesterases and other enzyme systems are deranged and hepatic function may be disturbed. Prompt treatment with padrin, pralidoxime, and atropine may prevent blindness which develops in some cases due to optic nerve atrophy. Prevention measures for the general population include avoidance of exposure to organophosphate pesticides, selection of high-protein diets, and avoidance of prolonged ingestion of only a small variety of vegetables and fruits. When each of five dogs was given 0.8-1.0 mg/kg of thiometone daily for 100 days from the sixth month of life, tremors of the hind legs were observed in two dogs, muscular atrophy in two dogs, myopia in three dogs, miosis in three dogs, mydriasis in three dogs, optic nerve atrophy in three dogs, inflammation of the optic nerve in three dogs, and erroneous projection in one dog.

72-2155. Gorbach, S.; Knauf, W. (Farbwerke Hoechst AG, Frankfurt am Main, Germany). **Endosulfan und Umwelt. Das Rueckstandsverhalten von Endosulfan in Wasser und seine Wirkung auf Organismen, die im Wasser leben. [Endosulfan and the environment. The behavior of endosulfan in water and its effects on aquatic organisms.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. 34: 85-93; 1971.* (3 references) (German)

Endosulfan is poorly soluble in water; it hydrolyzes slowly in aqueous solutions and more rapidly at alkaline pH. It is broken down rather quickly into endosulfan-alcohol by sludge microorganisms (ca. 50% in 7 days). It inhibits bacterial metabolism only when present in excess of 500 ppm. Algae also metabolize endosulfan and are not harmed at moderate endosulfan concentrations. LC50 values (24 hr) for various aquatic arthropods range from 0.001 ppm to 6 ppm. Its LC50 (48 hr) value of 0.22 ppm for *Daphnia magna* places it among the group of insecticides of moderate toxicity to this species. Toxic concentrations (LC100, 24 hr) for fish are between 0.001 and 0.01 ppm although fish can survive a concentration much higher than this for a short time; those which already display slight manifestations of intoxication recover upon transfer to clean water. Interpretation of the few available values for endosulfan residues in fish is difficult: residue levels of 0.4 ppm found in dead whitefish floating in the Rhine during the great fish kill in the summer of 1969 were lower than those in fish caught several weeks later, alive and without signs of pathological changes. This indicates that the fish kill was not due to endosulfan alone. The Rhine water at that time contained 0.1-1 ppb endosulfan.

72-2156. Wolthuis, O. L.; Meeter, E. (Medisch Biologisch Laboratorium, TNO, The Netherlands). **Onderzoek naar de behandeling van vergifting met strijdgassen of insekticiden van het organofosfaat type. [Investigation on the treatment of poisoning with organophosphate nerve gases or insecticides.]** *TNO-Nieuws 27(6): 285-290; 1972.* (9 references) (Dutch)

The mechanisms of organophosphate poisoning are reviewed with the intention of developing more effective antidotes for its treatment. The action of organophosphates, whether chemical-warfare agents or insecticides, has two components: the muscarinic and the nicotinic,

each corresponding to a type of acetylcholine-sensitive receptor at the synapse. Muscarinic receptors are found in the effector organs of the autonomic nervous system. Accumulation of acetylcholine at these receptors leads to uninterrupted stimulation giving rise to convulsions, excessive glandular secretion, and lowering of blood pressure. Muscarinic effects are combated by atropine. Nicotinic receptors are found in areas under voluntary control including the respiratory center of the central nervous system. The accumulation of acetylcholine at nicotinic receptor leads first to repetitive effects, then to blockage of stimulus transmission. Potentially useful respiratory antidotes in organophosphate poisoning, including oximes, were studied using newly developed methods for measuring the respiratory minute volume and the diaphragmatic contraction in experimental animals. Another useful model for studying therapeutic agents is the hypothermic response to organophosphates. The use of veratrine or a similar agent which extends a single nerve impulse to produce prolonged muscular contraction may alleviate the need for mechanical ventilation in organophosphate-poisoned patients.

72-2157. Parsons, A. J. (Barnfield, Tower Hill Road, Crewkerne, Somerset, England). **A possible connection between cerebro-cortical necrosis and susceptibility to organo-phosphorus poisoning?** *Vet. Rec. 90(20):577-578; 1972.*

In a Letter-to-the-Editor, symptoms of a case of cerebro-cortical necrosis are described in an 8-month-old heifer which responded to a parenteral B vitamin complex treatment. The animal was one of a batch of 15 of approximately the same age who were symptomless. The same batch was treated three months later with an organo-phosphorus warble-fly dressing, at which time the same heifer was found in a state of collapse two-and-a-half hours later with symptoms of organophosphorus poisoning (ataxia, salivation, dyspnoea, and mild convulsions). Injection of 90 mg of atropine sulfate resulted in complete recovery within a few hours.

72-2158. Anonymous. **Prevention of pesticide poisoning.** *WHO Chronicle 26(4): 156-159; 1972.* (2 references)

Organochlorine insecticides (e.g. DDT) are being phased out of use in agriculture owing to their chemical stability and persistence in the environment. They are being replaced by biodegradable insecticides such as organophosphorus compounds which are initially more toxic to man. Personnel assigned to work in pesticide factories should be medically sound, informed of the risks related to their work, and what safeguards are needed. The working environment should be constantly monitored and the workers kept under medical surveillance. Precise directions for use of each chemical must be specified. Hazards arising from ground and aerial spraying of pesticides are delineated and protective clothing and other safety measures described. The high mammalian toxicity of the organophosphorus compounds (notably parathion) is prompting research for more innocuous pesticides.

See also **72-2041** **72-2048** **72-2060** **72-2091** **72-2104** **72-2165**

72-2159. Nakagawa, M.; Kawakubo, K.; Ishida, M. (Agr. Chem. Res. Labs., Sankyo Co. Ltd., Shinagawa-ku, Tokyo, Japan). **Metabolism of the herbicide 3-(2′-methylphenoxy)pyridazine in plants.** *Agr. Biol. Chem. (Tokyo) 35(5): 764-777; 1971.* (16 references)

The uptake and metabolism of the herbicide 3-(2′methylphenoxy)pyridazine (H-722) was studied, using a tritium-labeled preparation, in barley (susceptible) and tomato (tolerant) plants. H-722 was readily absorbed by both species and was translocated to the leaves. Four metabolites were clearly detected in autoradiograms of ethanol extracts of barley shoots. Three were identified by TLC characteristics as 3-(2′methylphenoxy)pryidazine-1-oxide (M1), 3-pyridazinon-(2*H*)(M2), and 3-(1β-D-glucosyloxy)pyridazine(M3); the fourth metabolite could not be identified due to its scarcity. A small quantity of a material assumed to be *o*-cresol was also found. Almost all of the radioactivity in the ethanol extracts of the shoots from both species was chromatographically identified as unchanged H-722. The principal metabolite, M1, may be produced by the action of plant peroxidases. M1 had some herbicidal activity, whereas M2 and M3 had little or none. Additional studies on the fate of the *o*-cresol released may aid in elucidating the reasons for the selective toxicity of H-722.

72-2160. Tomizawa, C.; Uesugi, Y. (Nat. Inst. of Agr. Sci., Kita-ku, Tokyo, Japan). **Metabolism of *S*-benzyl *O,O*-diisopropyl phosphorothioate (Kitazin P) by mycelial cells of *Pyricularia oryzae*.** *Agr. Biol. Chem. (Tokyo) 36(2): 294-300; 1972.* (7 references)

The metabolism of Kitazin P by the rice blast fungus was studied, using the singly (^{35}S-) or doubly (^{32}P-, ^{35}S-) labeled compound. The mycelia took up the fungicide from the medium, and metabolized a large part of it to water-soluble metabolites which were then released back into the medium. Metabolites from the growth medium and from the mycelial cells were separated and identified by ion-exchange chromatography and thin-layer chromatography. The principal water-soluble metabolites appeared to be *S*-benzyl *O*-isopropyl diisopropyl hydrogen phosphorothioate; minor water-soluble metabolites appeared to be *S* -benzyl *O*-isopropyl hydrogen phosphorothioate, diisopropyl hydrogen phosphate, and isopropyl dihydrogen phosphate. The principal metabolite in the toluene-soluble fraction was the *m*-hydroxy derivative of Kitazin P. When Kitazin P was added to cultures of susceptible and resistant fungal clones at a level not sufficient to inhibit growth, the rates and extents of metabolism of the fungicide in the two cultures were similar.

72-2161. Uesugi, Y.; Tomizawa, C. (Nat. Inst. of Agr. Sci., Kita-ku, Tokyo, Japan). **Metabolism of *S*-benzyl *O*-ethyl phenylphosphonothioate (Inezin) by mycelial cells of *Pyricularia oryzae*.** *Agr. Biol. Chem. (Tokyo) 36(2): 313-317; 1972.* (4 reference)

Mycelia of the rice-blast fungus, *Pyricularia oryzae*, were incubated with Inezin at a concentration below the threshold for inhibition, then examined for the formation of metabolites. Mycelia were frozen, homogenized, acidified, and extracted with ether; culture media were also acidified and extracted with ether. Gas-liquid chromatography of the extracts revealed that the principal metabolites in the medium were ethyl hydrogen phenylphosphonate and *O*-ethyl-hydrogen phenyl-phosphonothioate, and small amounts of phenylphosphonic acid. The fate of the benzyl radical removed in the initial step of Inezin metabolism by *P. oryzae* was examined using Inezin labeled with ^{14}C on the benzyl radical. Traces of benzyl alcohol and dibenzyl sulfide were found on the thin-layer chromatograms of the toluene extracts, and large amounts of these products were found on the ion exchange chromatograms. Another major metabolite found on TLC was the *m*-hydroxy derivative of Inezin.

72-2162. Soeda, Y.; Kosaka, S.; Noguchi, T. (Div of Chem., Nisso Inst. for Life Sci., Nippon Soda Co. Ltd., Kanagawa Prefecture, Japan). **The fate of thiophanate-methyl fungicide and its metabolites on plant leaves and glass plates.** *Agr. Biol. Chem. (Tokyo) 36(6): 931-936; 1972.* (4 references)

To examine the persistence of thiophanate-methyl, 200μl of an aqueous suspension containing about 600μg of ^{14}C-phenyl(U)-labeled and 400μg of unlabeled thiophanate-methyl per ml was applied to the upper sides of young leaves of small potted apple trees and grape vines. With another technique 200μg was applied to a watch glass with a surface area of 6 cm^2. The plants and the glass were kept outdoors, except when it was raining. A total of 52 sunny days, 22 cloudy days (outdoors) and 16 rainy days (greenhouse) was reached. Specimens were taken initially at 3 hr and then 7, 14, 28, 54, and 90 days after treatment; specimens were then analyzed by TLC and autoradiography. The half-life of thiophanate-methyl on apple and grape leaves was 15 and 12 days respectively; small quantitits migrated to other parts of the plant. The half-life on the watch glass was 3 days. Fourteen days after treatment, 52.6% of the applied thiophanate was present on apple leaves as the parent compound and 10.1% as the major degradation product, methyl-2-benzimidazole carbamate. The percentages for grape leaves were 49.5 and 8.9% respectively; on the glass plates, 5.5 and 24.1% respectively.

72-2163. Salazar Mallen, M.; Gonzales Barranco, D.; Jurado Mendoza, J. (Laboratorio de Investigaciones Immunologicas, Secretaria de Salubridad y Asistencia, Mexico). **Trichlorophone treatment of onchocerciasis.** *Ann. Trop. Med. Parasitol. 65(3): 393-398; 1971.* (9 references)

Trichlorophone (trichlorfon) was administered orally at 7.5-15 mg/kg, one dose every two weeks to 13

male and 6 female carriers of *Onchocerca volvulus*. A total between 4 and 16 doses was administered. Trichlorfon was rapidly absorbed as indicated by a prompt decrease in blood acetylcholinesterase activity. An increase in the SGOT level was apparent at 24 hours; however, the SGOT values had returned to normal by the second week. Only muscarinic symptoms were noted in the patients: colic, nausea, cough, vomiting, and defecation. Seven of the patients, including two who received the maximum dose of 15 mg/kg, showed no toxic symptoms. In the remainder, the symptoms were transitory. The inflammatory response to the toxic products released by the dying parasites was tolerable. Trichlorfon treatment reduced the size of 25 of the 65 nodules examined by the end of treatment. New nodules occurred during the course of treatment in some patients; thus the main filaricidal action of trichlorfon appears to exist against stage III larvae. The number of microfilaria in skin snips taken two weeks after the last dose of trichlorfon was lower, on the average, by seven-fold than the number before treatment.

72-2164. Beesley, W. N. (Sch. of Trop. Med., Liverpool L3 5A, England). **A relationship in mice between dosage with insecticidal sulphonamides and hyperglycaemia.** *Ann. Trop. Med. Parasitol. 65(3): 417-418; 1971.* (10 references)

Sulfonamide derivatives of various structures have been used as antimicrobial, diuretic, and hypoglycemic agents. Some of the antimicrobial sulfonamides have been found to have insecticidal activity, whereas the tested hypoglycemic and diuretic sulfonamides have not. Organophosphates such as parathion and malathion have been found to cause hyperglycemia; therefore, the effects of various sulfonamides, as well as DDT and trichlorfon, on the blood sugar levels of rats were observed. Hyperglycemia developed rapidly and markedly after injection of sulfanilamide, sulfaquinoxaline, sulfadiazine (all insecticidal) and trichlorfon. A slow rise in blood glucose occurred after DDT administration with a peak at about 48 hr. Results obtained with sulfamethazine varied. Only one of five mice tested showed a marked blood sugar rise. Certain parasitic diseases as well as the treatments employed may also cause increases or decreases in the blood sugar level of the host. The relationships between blood sugar levels and other physiological parameters in warm-blooded animals requires further investigation.

72-2165. Kimbrough, R. D. (Chamblee Toxicol. Lab., Environ. Protect. Agency, 4770 Buford Hwy, Chamblee, GA 30341). **Toxicity of chlorinated hydrocarbons and related compounds. A review including chlorinated dibenzodioxins and chlorinated dibenzofurans.** *Arch. Environ. Health 25(2): 125-131; 1972.* (65 references)

Various chlorinated technical compounds, namely, 2,4,5-trichlorophenol, 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), and European chlorinated biphenyls (Phenoclor DP6 and Clophen A60), have been found to be contaminated with trace amounts of chlorinated dibenzofurans or chlorinated dibenzodioxins. Toxic fat which produces hydropericardium in chickens also contains chlorinated dibenzodioxins. These and other technical chlorinated compounds such as the technical pentachlorophenol have been implicated in causing chloracne, liver disease, teratogenicity, x-disease in cattle, and chick edema. The literature on the toxicity of the chlorinated technical compounds is reviewed. It is mentioned that 2,4,5-T and the chlorinated biphenyls also induce porphyria. Whether the various disease entities are caused by the contaminants, combinations of the chemical and its contaminants or by the chemicals themselves needs further evaluation. (Author abstract by permission)

72-2166. Asshauer, E.; Mohr, W. (Klinische Abteilung des Bernhard-Nocht-Institutes fuer Schiffahrts- und Tropenkrankheiten, Hamburg, Germany). **Thiabendazol: Wirkung und Nebenwirkungen. [Thiabendazole: efficacy and side effects.]** *Arzneimittel-Forsch. 21(8): 1278-1281; 1971.* (8 references) (German)

Since thiabendazole is used as a systemic anthelmintic in mammals as well as a fungicide for commodities, information is available for clinical effects and side effects from direct administration in man. In a series of 199 helminthiases in 153 patients treated, thiabendazole at a dosage of 50 mg/kg body weight was highly effective against *Strongyloides, Ascaris, Ankylostoma* and *Trichostrongylus* infestations, but ineffective against *Taenia* species. Approximately half of the patients treated (treatment time, 2 to 14 days) noted some side effects, notably, nausea, dizziness, headache, and drowsiness. Some displayed visual or mental disturbances, anorexia, urticaria, or confusion. Symptoms were alleviated by divided dosage or by simultaneous administration of antihistamines. In addition to helminthiasis many of the patients had other diseases. These did not seem to affect the results of the thiabendazole treatment. Laboratory studies performed before and after the thiabendazole treatment generally remained constant except for increases in transaminases in three cases.

72-2167. Bier, H.; Dedek, W. (Sektion Tierproduktion und Veterinaermedizin der Karl-Marx-Universitaet, Leipzig, DDR). **Transport, Verteilung und Rueckstaende von ^{14}C and ^{15}N-CCC (2-Chloraethyl-trimethylammonium-chlorid) in Weizen. [Transportation, distribution and residues of ^{14}C- and ^{15}N-CCC (2-chloroethyl-trimethylammonium-chloride) in wheat.]** *Biochem. Physiol. Pflanz. 163(2): 169-174; 1972.* (11 references) (German)

In hydroponic experiments, 90% of the ^{14}C-labeled CCC (chlormequat chloride) applied to the leaves of wheat plants was translocated to the roots within six

weeks. Formation of metabolites was not noted. In field experiments, $^{14}C/^{15}N$-CCC was applied to wheat as a leaf spray at rates of 1, 1.5, and 2 kg/ha when the plants were 8-10 cm high. Four months after treatment, the straw of the wheat treated at 1.5 kg/ha contained 1.1 ppm CCC; the chaff, 0.7 ppm; the bran, 0.2 ppm; and the flour, 0.03 ppm; in straw and bran, 85% of the radioactivity was present as CCC and 15% as choline chloride (CC). Only 80-85% of the radioactivity present at the time of harvesting was extractable with ethanol. It was not possible to determine whether the biotransformation of CCC was accomplished by enzyme systems present in the plant or by epiphytic bacteria, which have ready access to the CCC in the dying plant parts with increasing plant age.

72-2168. Pace, W. E.; Purres, J. (Dermatol. Clin., Victoria Hosp., London, Ont., Canada). **Resurgence of scabies.** *Can. Med. Ass. J. 104: 719; 1971.* (1 reference)

An approximately ten-fold increase in the number of patients with scabies was noted in the dermatological outpatient department of Victoria hospital and among patients seen in private practice during the last months of 1970 and the first months of 1971. A large number of treatment failures occurred following the use of both BHC lotion (Kwellada) and benzylbenzoate emulsion by reliable patients. Failure was demonstrated by recovery of the scabies organism from skin scrapings following unsuccessful treatment. When such failures occurred, a return to the application of 10% precipitated sulfur ointment three times a day for three days afforded success. These findings suggest that resistant forms of *Sarcoptes scabiei* var. *hominis* may have developed, and may account for the scabies epidemics currently reported in various areas of the world.

72-2169. Mattocks, A. R.; White, I. N. H. (M.R.C. Toxicol. Unit, Med. Res. Council Lab., Woodmansterne Rd., Carshalton, Surrey, Great Britain). **The conversion of pyrrolizidine alkaloids to *N*-oxides and to dihydropyrrolizine derivatives by rat-liver microsomes *in vitro*.** *Chem.-Biol. Interactions 3(5): 383-396; 1971.* (40 references)

The conversion of pyrrolizidine alkaloids to dihydropyrrolizine derivatives ("pyrrole derivatives") and to *N*-oxides in the rat liver is catalyzed by an enzyme present in the microsomal fraction, typical of the mixed-function oxidases. The conversion of retrorsine to pyrrolic metabolites and to *N*-oxides was significantly induced by pretreatment with phenobarbitone or DDT, with the induction of pyrrole derivatives being greater than that of *N*-oxides. Other factors influencing the metabolism of these alkaloids were also studied.

72-2170. Curley, A.; Burse, V. W.; Grim, M. E.; Jennings, R. W.; Linder, R. E. (Chamblee Toxicol. Lab., Environ. Protect. Agency, Chamblee, GA 30341). **Polychlorinated biphenyls: distribution and storage in body fluids and tissues of Sherman rats.** *Environ. Res. 4(6): 481-495; 1971.* (40 references)

The metabolism of PCBs in the rat was investigated after administration of single oral doses of 1600 or 3200 mg/kg (Aroclors 1254 and 1260) in the diet. The dosages were 1000 ppm for 98 days; 100 ppm for 58 days followed by a recovery period on unfortified chow; and 100 or 500 ppm for 252 days. PCBs in organs, tissues, urine, and feces were determined by gas chromatography. Sample preparation comprised extraction with hexane followed by cleanup on a silica gel microcolumn. Gas chromatograms of tissue and urine extracts did not contain all of the peaks present in the original Aroclors, indicating that either metabolism or differential absorption took place. Only the fecal samples gave the original Aroclor pattern. One day after administration of the single oral dose of 1600 mg/kg Arclor 1254, a mean PCB content of 1147 ppm was found in the fat, 274 ppm in the kidney, 138 ppm in the brain, 141 ppm in the liver, 66 ppm in the lung, 80 ppm in muscle, and 24 ppm in plasma. After 98 days of treatment of male rats with 1000 ppm Arochlor 1254 in the diet, the fat contained 11,278 ppm, and the remaining tissues less than 200 ppm. In the 252-day experiments, a steady buildup of Aroclors in tissues occurred.

72-2171. Landauer, W.; Salam, N.; Sopher, D. (Dept. of Animal Genetics, Univ. College London, London NW1, England). **The herbicide 3-amino-1,2,4-triazole (Amitrole) as teratogen.** *Environ. Res. 4(6): 539-543; 1971.* (17 references)

Aqueous solutions of amitrole were injected into the yolk sac of chicken eggs at 0, 24, 48, and 96 hr of incubation. The embryonic mortality caused by amitrole injection at 20 mg/egg was 56% at 0 hr, 17% at 24 hr, 12% at 48 hr, and 41% at 96 hr. A distinct dependence upon the dosage was observed in the series of 96-hr mortality figures. Of the surviving embryos in the group treated at 96 hr, 100% were normal in the group injected with 0.5-2 mg amitrole per egg; 20.7% had abnormal beaks and 3.7% miscellaneous defects in the 10-mg group; 48.6% had abnormal beaks and 2.8% miscellaneous defects in the 20 mg group; 60.6% had abnormal beaks, 17.0% had bent tibia, and 1.1% had miscellaneous defects in the 40 mg amitrole per egg group. Malformation rates in eggs treated with 20 mg/egg at 0, 24, and 48 hr were substantially lower. Beak abnormalities ranged from a slight shortening of the lower beak to severely crossed beaks, generally with the upper beak deviating to the left. Administration of various vitamins, proteins, and cofactors simultaneously with amitrole did not prevent the teratogenic effects of the herbicide. Dissolving the amitrole in dimethyl sulfoxide instead of water reduced the malformation rate.

72-2172. Sperling, F.; Ewenike, H. K. U.; Farber, T. (Dept. Pharmacol., Howard Univ. Sch. of Med., Washington, DC 20001). **Changes in LD50 of parathion and heptachlor following turpentine pretreatment.** *Environ. Res. 5(2): 164-171; 1972.* (20 references)

Oral administration of turpentine to the male rat stimulated the production of hepatic microsomal enzymes, resulting in reduced hexobarbital sleeping time. Pretreated rats also had a lower mortality rate when given a LD50 dose of parathion, but a higher mortality rate than controls when given a LD50 dose of heptachlor. The mortality rates were identical in treated and untreated groups given LD50 doses of paraoxon and heptachlor epoxide. The 9000 × *g* liver supernatants from turpentine-pretreated rats (turpentine administered orally or by inhalation) showed enhanced hexobarbital hydroxylase, aminopyrine demethylase, aniline hydroxylase, and benzpyrene hydroxylase activities. Terpin hydrate pretreatment had no effect on parathion toxicity, but inhibited aminopyrine demethylation. Oral administration of menthol did not change parathion toxicity, but stimulated hexobarbital hydroxylation and inhibited *p*-aminophenol aniline hydroxylation and aminopyrine demethylation.

72-2173. Seiler, D. (Medizinische Poliklinik der Universitaet, D-69 Heidelberg, Germany). **The ATPases of the sarcolemma from skeletal muscle in experimental myotonia.** *Experientia 27(10): 1170-1171; 1971.* (10 references)

The activity of the (Mg^{2+})- and the $(Na^{+} + K^{+})$-stimulated ATPases of the sarcolemma from rats with myotonia induced by 20,25-diazacholesterol is distinctly reduced. Addition of 2.5 m*M* of 2,4-dichlorophenoxyacetate (2,4-D) to the assay mixture inhibits both ATPases by about 60%. (Author abstract by permission, translated from the German)

72-2174. Okazaki, H.; Kimura, S. (Sch. of Nutr. Chem. Fac. of Agr. Tohoku Univ., Senadi-shi, Japan). **[On the toxicity of food additives and pesticides, and their effects on lysosome.]** *Eiyo To Shokuryo (J. Jap. Soc. Food Nutr.) 25(3): 201; 1972.* (Japanese)

Preliminary experiments were conducted to find methods of estimating the toxicity of food additives, pesticides, and disinfectants. The release of enzymes by the rat liver lysosomes was studied since the lysosome is presumed to play an important role in the elimination of foreign substances. When damaged by radiation or chemicals, the lysosomal membrane breaks, releasing the enzymes contained therein. The extent of damage to the lysosomal membrane was determined *in vivo* and *in vitro* by the ratio of activity of released enzyme (F) to total enzyme (T). The pesticide tested, BHC, produced severe damage to lysosomes *in vitro* and *in vivo*, the F/T ratio of β-glucuronidase after BCH application *in vitro* amounting to almost 100% after 90 min at 37°C. The lysosomal membrane is more unstable in vitamin-E deficient animals, and damage by chemicals thus enhanced. After administration of BHC (dosage not specified) in the diet for 150 days, F/T for β-glucuronidase was 48.8% compared to 28.2% for controls.

72-2175. Kiriyama, S.; Inoue, S.; Machinaka, N.; Yoshida, A. (Sch. of Nutr. Sci., Fac. of Med., Tokushima Univ., Tokushima-shi, Japan). **[On the physiological action of PCB and DDT and the effects of non-nutritive polysaccharides on this action.]** *Eiyo To Shokuryo (J. Jap. Soc. Food Nutr.) 25(3): 205; 1972.* (Japanese)

Since it has been found that polysaccharides such as konjac mannan, CMC, and pectin are capable of suppressing the intestinal absorption of fat-soluble cholesterol, the possibility of using such substances to decrease the absorption of fat-soluble pesticides and related compounds (PCB, DDT) was investigated. Young male Wistar rats were fed a standard diet containing 20% casein with the addition of 0, 0.02, and 0.2% DDT, and 0, 3, or 5% konjac mannan or pectin for 14 days. Diets containing only DDT significantly reduced gains of body weight. The addition of konjac mannan to the DDT containing diet tended to improve the weight gain. The liver to body-weight ratios were elevated above the controls in animals receiving 0.1 or 0.2% PCB in the diet. The addition of the polysaccharides did not reverse these increases. Furthermore, plasma cholesterol levels were also increased by the addition of PCB or DDT to the diet; the degree of this increase was reduced by simultaneous administration of konjac mannan.

72-2176. Smith, P. W.; Mertens, H.; Lewis M. F.; Funkhouser, G. E.; Higgins, E. A.; Crane, C. R.; Sanders, D. C.; Endecott, B. R.; Flux, M. (Aviation Toxicol. Lab., Civil Aeromed. Inst., Fed. Aviat. Admin., Oklahoma City, OK 73125). **Toxicology of dichlorvos at operational aircraft cabin altitudes.** *Aerosp. Med. 43(5): 473-378; 1972.* (9 references)

The World Health Organization selected dichlorvos for use in the disinsection of aircraft on international flights because of its demonstrated efficacy, suitability for automated dispensing, and safety to animals and human volunteers in toxicologic tests. However, previous toxicology tests had not excluded the possibility of increased dichlorvos toxicity at high altitudes. Therefore, studies were performed with eight human volunteers under simulated aircraft operation conditions. Baseline values were determined at ground level without dichlorvos. Measurements were taken at a simulated altitude of 8000 ft without dichlorvos, and with dichlorvos present at a concentration 5 to 10 times greater than that employed for aircraft disinsection. Values measured included plasma and erythrocyte cholinesterase activity, threshold sensitivity (which is known to be affected by reduced oxygen tension), evaporative water loss from a skin area, and bronchiolar resistance. The latter two

measurements are known to be sensitive to cholinesterase inhibition. No alterations in cholinesterase activity in any of the experimental situations were noted. As expected, dark adaptation of the retina was impaired and evaporative water was increased at the simulated high altitudes. However these values were not changed by the presence of dichlorvos. Bronchiolar resistance remained essentially constant.

72-2177. Soennichsen, N.; Barthelmes, R.; Barthelmes, H. (Klinik und Poliklinik fuer Hautkrankheiten der Friedrich-Schiller-Universitaet, Jena, DDR). **Untersuchungen zum derzeitig gehaeuften Auftreten, zur Klinik und Therapie der Scabies. [Studies on the currently increased occurrence and clinical and therapeutic aspects of scabies.]** *Deut. Gesundheitsw. 28: 1178-1183; 1970.* (12 references) (German)

The increased incidence of scabies currently noted in East Germany cannot be explained by any of the standard criteria such as poor hygiene and sanitation, crowded living conditions, etc., blamed for wartime occurrences. Immunology offers a plausible explanation: the cyclic occurrence of scabies depends on the availability of a new, unexposed generation every 15-20 years. However, this does not explain the therapeutic failures observed with the previously successful miticides, some of which were based on DDT. Speculation has centered on the development of resistance to DDT by the mites. The Jena Skin Clinic thus uses currently a topical agent containing 1% lindane. On the first day of treatment the patient is bathed and anointed with the lindane emulsion. On the second day, the emulsion is applied and left on. The patient is bathed again on the third day. Concomitantly, the patient's clothing is sterilized with cold, heat, or lindane; all bedding is disinfected. This therapy has been successful in all cases. No irritation or allergic manifestations in the skin have been observed.

72-2178. Geldmacher-v. Mallinckrodt, M.; Baumgartner, W.; Petenyi, M.; Burgis, H.; Lindorf, H. H.; Metzner, H. (Institut fuer Rechtsmedizin der Universitaet Erlangen-Nuernberg, D-8520 Erlangen, Germany). **Korrelation zwischen der unterschiedlichen Vergiftbarkeit der Serum-Cholinesterase durch E 600 und der Aktivitaet des E 600-spaltenden Enzym-Systems in menschlichen Seren. [Correlation between variation in susceptibility of serum cholinesterases to poisoning by paraoxon, and the activity of the paraoxon-cleaving enzyme system in human sera.]** *Hoppe-Seylers Z. Physiol. Chem. 353(2): 217-220; 1972.* (16 references) (German)

Previous studies demonstrated that after contact with paraoxon at $3.2 \times 10^{-8} M$, serum samples from different individuals retain varying fractions of their initial cholinesterase activity (between 0 and 50%). This may be attributed to polymorphism of the serum cholinesterases or to polymorphism of the enzyme(s) responsible for cleavage of paraoxon. To study this question, sera from 50 test subjects with previously determined residual cholinesterase activity were examined for arylesterase activity by the Krish method. The values found were plotted against the residual cholinesterase activity, and a correlation coefficient of 0.82 was found. Arylesterase activities ranged from 50 to 370 μmol *p*-nitrophenol/min.ml serum. The distribution appeared to be trimodal, corresponding to the high, medium, and low residual cholinesterase groups previously found.

72-2179. Anonymous. **Pyrethrum-fed rats have liver hypertrophy.** *HSMHA (Health Serv. Ment. Health Admin.) Health Rep. 86(7): 603-604; 1971.*

Administration of pyrethrum to rats at dosages of 200 mg/kg for 13-23 days produced liver hypertrophy. Water and protein concentrations in liver homogenates did not change, but decreases in DNA concentrations and increases in total lipids were found. The lipid increases were not sufficient to account for the liver enlargement. The effects of hexobarbital in the treated rats were reduced, but not those of barbital. Hexabarbital is known to be metabolized in the rat liver, whereas barbital is not, suggesting that hepatic drug-metabolizing mechanisms in the treated rats were enhanced. Dose-dependent increases in the activities of several microsomal enzymes were recorded. These values returned to control levels within seven days after cessation of treatment. Cellular hypertrophy in the livers was also observed.

72-2180. Okamoto, H. (Central Res. Inst. Hokko Chem. Ind. Co., Ltd., Japan). **On the characteristics of Kasumin antibiotic fungicide.** *Jap. Pestic. Inform. 10: 66-69; 1972.*

Kasugamycin (KSM) is described as a highly safe and efficacious fungicide against rice blast fungus. The HCl salt of KSM is used as the active ingredient. Acute and subacute toxicity tests in rats and in dogs produced no unfavorable effects. In humans, 95% of the KSM injected subcutaneously was excreted in the urine within 24 hr. KSM residues in rice grain and straw were under the minimum limit of detection by bioassay. Toxicity to fish and to honey bees is reported, but not to silkworms. The antimicrobial activity investigation of KSM showed almost no inhibitory activity to the germination of conidia of rice blast fungus, minimum inhibitory concentration of KSM to mycelial growth, and inhibition of the sporulation of the rice blast fungus at high concentration. Phytotoxicity was not observed. Most strains of the fungi are not resistant to KSM.

72-2181. Sekine, B. (Technical Sect., Pestic. Div., Nippon Kayaku Co., Ltd., Japan). **Metabolism of diazinon (*O,O*-diethyl-*O*-(2-isopropyl-4-methyl-6-pyrimidinyl) phosphorothioate).** *Jap. Pestic. Inform. 10:*

77-80; 1972. (5 references)

Studies of the metabolism of diazinon in rice plants and in mice are described. For the plant investigation, ^{32}P-labeled diazinon was used. Results in both the paddy rice and upland rice showed that the amount of diazinon in the rice plant reached a maximum on the 5th day and occurred in the following order: sheath> blade> root. By means of the radio-chromatogram of the sheath, the presence of diazinon, diazoxon, *O,O*-diethyl-*O*-(2-(α-hydroxyisopropyl)-4-methyl-6-pyrimidinyl) phosphorothioate (compound III) and an unknown compound was confirmed. The metabolism *in vivo* in mice of diazinon resulted in the active metabolites of diazoxon, compound III, and others. A speculative metabolic pathway of diazinon is shown in a diagram for both rice plant and mouse. The metabolism in houseflies was marked by a distinct difference between the susceptible and the resistant strains of insects.

72-2182. Smith, P. (Dept. of Pathol., Univ. of Liverpool, England). **A light- and electron-microscope study of the pulmonary lesions induced in rats by paraquat.** *J. Pathol. 104(3): vii; 1971.*

Light- and electron-microscopic examinations were performed on lungs of test rats given intraperitoneal injections of paraquat solution at 10 mg/kg body weight every 14 days for up to 112 days. The first lesions seen in rats killed between days 15 and 60 consisted of intracytoplasmic edema in granular pneumocytes; these were followed by disintegration of alveolar epithelium and inflammation of alveolar walls. Large numbers of mesenchymal cells were seen to infiltrate the alveolar walls and spaces at 67 days. The appearance of plump fibroblasts dominated the picture between 70 – 98 days, and by 100 days, large lung areas were occupied by loose fibrous matter with alveolar spaces obliterated. The lungs of the two rats killed on day 112 contained, in addition to the loose fibrosis, areas of compact interstitial fibrosis, patent alveoli, alveolar macrophages, and granular pneumocytes continuously lining the alveoli. Similar findings were obtained when rats were given a single larger dose of paraquat.

72-2183. Sinsheimer, J. E.; Guilford, J.; Bobrin, L. D.; Schteingart, D. E. (Coll. of Pharm., Univ. of Michigan, Ann Arbor, MI 48104). **Identification of *o,p'*-dichlorodiphenyl acetic acid as a urinary metabolite of l-(*o*-chlorophenyl)-1-(*p*-chlorophenyl)-2,2-dichloroethane.** *J. Pharm. Sci. 61(2): 314-316; 1972.* (7 references)

The treatment of adrenocortical carcinoma and adrenocortical hyperfunction with TDE (Mitotane) or (1-(*o*-chlorophenyl)-1-(*p*-dichlorodiphenyldichloroethane) prompted an investigation of *o,p'*-dichlorodiphenyl acetic acid as a urinary metabolite in both rabbit and man. This metabolite was found in the urine of four rabbits who had ingested a total of 1.18-2.13 g of Mitotane over 11-18 days. The presence of the metabolite was detected in the ether-extracted fraction containing strong acids on the basis of flame-ionization by gas-liquid chromatography of the bromosilyl ester. The finding was further confirmed by TLC. In humans the metabolite was detected in the urine of 3 patients under treatment for adrenocortical carcinoma (3-16 g of Mitotane) in a similar manner by GLC and TLC. Isolation and characterization of the metabolite were corroborated by IR spectra. A patient receiving 4 g of Mitotane for 58 days had a blood level of 6 μg/ml of the parent compound and excreted 8.3 mg of DDA as the free acid and 39.7 mg in conjugated form in a 24-hr urine sample.

72-2184. Faff, J. (Zaklad Farmakologii Doswiadczalnej AM, Warsaw, Poland) **Zagadnienie analizy wskaznikow biochemichnych zatrucia zwiazkami fosforoorganicznymi w zaleznosci od budowy chemicznej inhibitora. [Features in the variation of biochemical parameters following organophosphate poisoning as affected by the chemical structure of the inhibitor.]** *Med. Pracy 22(4): 415-420; 1971.* (41 references) (Polish)

The importance of chemical structure of different organophosphates is discussed in relation to the inhibition of cholinesterase (ChE) and acetylcholinesterase (AChE), and in the influence of the relationship between severity of intoxication and the decreased activity of AChE of red blood cells and the ChE of serum. Compounds with greater ability to cross the blood-brain barrier and inhibit these enzymes in the CNS and muscles are more toxic than those which do not although their effect on the esterases in the blood is comparable. Hydrophilic compounds are less able to penetrate the CNS, thus are less toxic. Recuperation from intoxication is greatly affected by the difference in AChE regeneration in brain and blood. The return of AChE to normal levels in the blood is much faster than in the brain, thus convalescence after poisoning with compounds which penetrated into the CNS will take longer. Compounds with greater activity against AChE of RBC than ChE of serum are significantly more toxic than those with specific activity against ChE. Finally, although organophosphate compounds are usually classified as irreversible inhibitors of AChE, spontaneous reactivation of AChE does occur, but is to a great extent influenced by the chemical structure of the inhibitor.

72-2185. Ribbeck, R.; Hornawasky, G.; El Sabban, M. (Sektion Tierproduktion und Veterinaermed., Humboldt-Univ., Berlin, DDR). **Klinische Vertraeglichkeit und Rueckstandsdynamik bei Anwendung von Organophosphat-Praeparaten auf Metrifonatum-Basis mittels Aufgiess-Verfahrens bei Merinoschafen. [Clinical tolerance and residue dynamics following pour-on application of preparations containing the organophosphorus compound Metrifonate in sheep.]** *Monatsh. Veterinaermed. 25: 593-596; 1970.* (16 references) (German)

Two preparations (FWI 2969, containing 6% Metrifonate and FWI 3069, containing 8% Metrifonate) were applied to seven experimental sheep at the rate of 40 mg/kg (active ingredient) requiring Janet syringes due to the high viscosity of the preparations. No local or systemic signs of intolerance were observed. Two lambs displayed no impairment of general conditions or development due to ingestion of contaminated milk from their treated mothers. The insecticidal activity of Metrifonate resulted from its conversion to dichlorvos in the body, especially in the liver. Percutaneous absorption was rapid. Metrifonate and dichlorvos were detected in the blood within 1 hr after application of the 6% preparation. The highest blood levels (0.02-0.03 ppm for Metrifonate, 0.02-0.10 ppm for dichlorvos) were detected 9-12 hr after application. Dichlorvos was detectable in the blood as late as the 6th day after application of the 8% preparation. Metrifonate appeared in the milk after 1 hr and persisted for 11 hr; dichlorvos appeared in blood and milk 1 hr after application of the 8% preparation. Dichlorvos remained in the blood at 0.03 ppm and in the milk at 0.01 ppm 6 days after administration of the 8% preparation. Delayed absorption of the more concentrated preparation was attributed to its higher viscosity.

72-2186. Dedek, W.; Schwarz, H. (Forschungsstelle fuer Chemische Toxikologie der Deutschen Akademie der Wissenschaften zu Berlin, Leipzig, DDR). **Zur Rueckstandsbildung von ^{32}P-markiertem Dimethoat nach Rueckenwaesche beim Rind. [Formation of residues by ^{32}P-labeled dimethoate after back-washing in cattle.]** *Monatsh Veterinarmed. 25: 963-964; 1970.* (6 references) (German)

^{32}P-labeled dimethoate was applied to cattle at 30 mg/kg body weight by brushing on the solution along both sides of the spine. The concentrations of active ingredient in blood and milk were determined via chloroform extracts at various times after application; the limit of detection was 0.01 ppm. Maximum residue levels of 0.02 ppm in blood and milk were reached about 3 hr after application, dropping to 0.01 ppm by 9 hr. The residue dynamics were similar to those previously found for trichlorfon.

72-2187. Hashimoto, Y.; Makita, T.; Mori, T.; Nishibe, T.; Noguchi, T. (Bio-Med. Res. Labs., Inst. for Life Sci., Nippon Soda Co., Ltd., Oiso-machi, Kanagawa-ken, Japan). **Toxicologic and pharmacologic studies on acetamide, as an antidote against monofluoroacetamide poisoning; studies on the selective toxicity. XVII.** *Oyo Yakuri (Pharmacometrics) 4(3): 451-462; 1970.* (32 references)

Acetamide is the most effective of the compounds, containing two carbon atoms, which are used as antidotes against poisoning by monofluoroacetamide derivatives. The acute toxicity of acetamide in mammals, regardless of administration route, is low; LD50 values of 10 g/kg body weight by intravenous injection were found in mice and rats. In subacute toxicity tests in rats and rabbits, administration of acetamide at up to 1 g/kg/day for 90 days had no marked effect on weight gain, and produced no marked signs of toxicity. During the subacute toxicity tests, studies were performed on clinical condition, hematologic data, organ function, and urinary factors; tissues were examined grossly and microscopically after sacrifice. Histologic abnormalities, slight and not dose-dependent, were found in heart, liver, lung, and brain. Some of the treated rats displayed lymphocyte infiltrations in the Glisson capsules and slight proliferation of the bile duct; congestion of liver and kidney were seen in some treated rabbits. Acetamide proved pharmacologically inactive as determined by observations of effects on the central nervous system, cardiovascular and respiratory systems, and blood.

72-2188. Makita, T.; Hashimoto, Y.; Noguchi, T. (Bio-Med. Res. Labs., Nisso Inst. for Life Sci., Nippon Soda Co., Ltd., Oiso-Machi, Kanagawa-ken, Japan). **Teratological studies of *N*-methyl-*N*-(1-naphthyl)-fluoroacetamide in mice.** *Oyo Yakuri (Pharmacometrics) 4(3): 463-468; 1970.* (8 references)

Since the approximate oral LD50 of *N*-methyl-*N*-(1-naphthyl)-fluoroacetamide (MNFA) in ICR-strain female mice is 200 mg/kg body weight, groups of pregnant mice were treated from days 1 to 12 of gestation with 4, 10, or 20 mg/kg of MNFA per day. No differences between treated and control groups of females were noted in weight gain, behavior, or food intake. No significant difference between treated and control groups was detected in relation to fetal body weight, fetal mortality, or sex ratio. The average surviving litter size in the group treated with the highest MNFA dosage was significantly lower than that of the controls. Although the numbers of resorbed fetuses and of immature dead fetuses did not differ from those in the control, larger numbers of live immature fetuses were found in the high-dosage group. No gross anomalies of visceral organs, central nervous system, or skeleton were found, except that separation of the sternum and the lumbar ribs occurred more frequently in the high-dosage group than in the other groups.

72-2189. Yamamoto, H.; Kuchii, M.; Hayano, T. (Dept. of Pharmacol., Wakayama Med. Coll., Wakayama, Japan). **[Teratological studies on prothrin in mice and rats.]** *Oyo Yakuri (Pharmacometrics) 4(5): 779-787; 1970.* (2 references) (Japanese)

Prothrin (5-propargyl-2-furylmethyl *dl-cis, trans*-chrysanthemate) was administered intraperitoneally to pregnant ICR mice and Sprague-Dawley rats, between days 7 and 12 of gestation in mice, and between days 9 and 14 of gestation in rats. Dosages employed were 10 and 100 mg/kg body weight. Dosages of 500 and 1000

mg/kg caused reductions in weight gains of non pregnant animals, but the dosages administered to the pregnant animals produced no reduction in weight gain, number of implants, or live fetuses, and no increases in dead or resorbed fetuses. Organ anomalies were not observed. Skeletal anomalies (extra ribs, disproportion of the sternum, incomplete ossification of vertebrae) occurred with approximately equal frequency in treated and control animals, so that prothrin appears to have no teratogenic effect.

72-2190. Yamamoto, H.; Kuchii, M.; Hayano, T.; Nishino, H.; Furuta, H.; Masuda, M.; Matsumoto, M. (Dept of Pharmacol., Wakayama Med. Coll., 9-Bancho, Wakayama, Japan). **[The pharmacological actions of Cyanox, a new organic phosphorus insecticide.]** *Oyo Yakuri (Pharmacometrics) 5(1): 75-86; 1971.* (11 references) (Japanese)

Cyanox was tested for pharmacological activity in a variety of experimental situations. The oral LD50 was 1000 mg/kg, and the ip LD50, 880 mg/kg. When Cyanox was administered to cats at a dosage of more than 5 mg/kg (iv), a low-amplitude fast wave appeared in the cortical EEG, accompanied by increased blood flow in the hippocampus; however, no change was noted in EEG or blood flow in the hypothalamus, even at a dosage of 10 mg/kg. Cyanox administration produced a brief lowering of blood pressure in the normal and the spinal cat, but had no effect on the EKG. Cyanox suppressed the corneal and conjunctival reflexes in the rabbit, but did not cause hyperemia of conjunctiva, lacrimation, or changes in the shape of the pupil. In *in vitro* tests on the isolated rat diaphragm, Cyanox facilitated the contraction due to indirect stimulation, but depressed the contraction due to direct stimulation. Cyanox depressed the contraction of atrium and ventricle, spontaneous movement of the ileum, and the increased ileal tension produced by acetylcholine, barium ion or histamine. Cholinesterase activity *in vitro* was inhibited by 11% at $2.3 \times 10^5 M$ Cyanox, and by 66.3% at $2.3 \times 10^2 M$.

72-2191. Fujimura, H.; Tsurumi, K.; Hiramatsu, Y.; Nozaki, M.; Hayashi, M.; Ito, K.; Ojima, A.; Kawada, K. (Dept. of Pharmacol., Gifu Univ. Sch. of Med., Gifu, Japan). **[Toxicity studies of prothrin (D-1201), a new synthetic pyrethroidal insecticide.]** *Oyo Yakuri (Pharmacometrics) 5(4): 605-617; 1971.* (4 references) (Japanese)

Results of toxicity testing on prothrin (5-propargyl-2-furylmethyl *dl-cis, trans*-chrysanthemate) are presented. The LD50 of prothrin in male mice is 1409 mg/kg ip and 11,711 mg/kg po; in rats, 1,926 mg/kg ip and more than 16,850 mg/kg po. The most prominent toxic symptom in the case of peroral administration was diarrhea, which may be due to the emollient action of the oily compound. The high oral LD50 suggests that prothrin is not readily absorbed from the gastrointestinal tract. No deaths were observed among rats given feed containing 10,000 or 15,000 ppm prothrin for one month, or 4,000, 8,000, or 12,000 ppm prothrin for three months. No abnormalities were observed in the animals which received prothrin, except for a dose-related reduction in the rate of weight gain. This reduction may be due to interference with the intestinal absorption of food constituents. Increased organ-to-body weight ratios were found in livers and kidneys of treated animals, but histological changes were not seen in these organs.

72-2192. Yamamoto, H.; Yano, I.; Nishino, H.; Furuta, H.; Masuda, M. (Sch. of Pharmacol., Wakayama Med. Coll., Wakayama-shi, Japan). **[Teratological studies on Cyanox in rats.]** *Oyo Yakuri (Pharmacometrics) 6(3): 523-528; 1972.* (1 reference) (Japanese)

The teratogenic properties of Cyanox were investigated by peroral administration at 1-10 mg/kg body weight to pregnant female Sprague-Dawley rats on days 9-14 of gestation. On the 20th day of gestation, the rats were killed, and the number of live and dead fetuses, resorptions, and implantation sites were counted. The body weight, body length, anogenital distance, external and internal development, and skeletal development were investigated. Young rats were observed for 26-30 days. The weight gains of the mothers were transiently reduced during the administration of 10 mg/kg, but no abnormalities in maternal fertility or fetal development were noted. The progress of sexual differentiation and skeletal ossification of the young did not differ between treated and control groups.

72-2193.. Hattula, M. L.; Karlog, O. (Dept. of Org. Chem., Univ. of Jyvaeskylae, Jyvaeskylae, Finland). **Toxicity of polychlorinated biphenyls (PCB) to goldfish.** *Acta Pharmacol. Toxicol. 31(3): 238-240; 1972.* (6 references)

Due to the strong adsorption of polychlorinated biphenyls (PCBs) from water solutions to glass surfaces, toxicity evaluations of fish in glass aquaria may be unreliable. Aluminum foil containers were used in a study on veil-tailed goldfish which were exposed to 0 – 4.0 ppm PCB in water (originally obtained as Clophen A 50 [Bayer] and diluted from a stock solution containing 10 mg PCB per ml in acetone). The concentration of acetone was adjusted to 0.5 ml/l. The harmful effects of PCB included loss of appetite, change in color (from orange to pale yellow), and uncoordinated movements. Because of the very low fat content of the fish (0.34-1.14%) the calculated PCB concentrations in the fat tissue were found to be remarkably high (13.5 mg/g to 93.1 mg/g). The concentrations of PCB in dead fishes observed were from 250-325 ppm in whole specimens.

72-2194. Platonow, N. S.; Liptrap, R. M.; Geissinger, H. D. (Dept. Biomed. Sci., Ont. Vet. Coll., Univ. of

Guelph, Guelph, Ont., Canada). **The distribution and excretion of polychlorinated biphenyls (Aroclor 1254) and their effect on urinary gonadal steroid levels in the boar.** *Bull. Environ. Contam. Toxicol. 7(6): 358-365; 1972.* (19 references)

The effect of oral administration of polychlorinated biphenyls (PCB) was investigated in the adult boar as detected in tissues and excreta. Testicular steroids were also examined in view of the high excretory levels reported in this species. Examination for the presence of pathological lesions was carried out. Four boars were fed respectively a single dose of 10 mg PCB, a 100 mg dose, 10 daily doses of 1 mg and 10 of 10 mg per kg of body weight. PCB extracts from urine and feces were analyzed by gas chromatography. The concentration of PCB in the various tissues was found to be lowest in blood and highest in perirenal fat. In the urine and feces, the highest amount after a single dose was found on the 2nd day and multiple doses resulted in increased urinary excretion of PCB during the experiment. The urinary excretion of estrogen and dehydroepiandrosterone was markedly reduced following the ingestion of the higher doses of PCB. No visible lesions were observed at autopsy.

72-2195. Derr, S. K.; Zabik, M. J. (Dept. of Entomol.-Pestic. Res. Cent., Michigan State Univ., E. Lansing, MI 48823). **Biologically active compounds in the aquatic environment: The effect of DDE on the egg viability of *Chironomus tentans*.** *Bull. Environ. Contam. Toxicol. 7(6): 366-368; 1972.* (5 references)

The effect of 1,1′-dichloro-2,2′-bis(*p*-chlorophenyl)ethylene (DDE) residues on the egg viability of the aquatic midge, *Chironomus tentans*, is described. Four different experimental treatments were conducted: controls with DDE uncontaminated eggs in water with alcohol concentration equivalent to experimental solutions; no DDE in water-DDE contaminated eggs; DDE in water-uncontaminated eggs; and DDE in water-DDE contaminated eggs. The initial contamination of the egg masses was effected by a solution of DDE in ethanol in a concentration of 30 parts per billion (ppb). After a developmental time of one month, the emerging adults were collected separately and allowed to mate, and the egg masses from these DDE-exposed and control females collected and observed. There was a significant reduction in the number of *C. tentans* adults emerging from aquaria containing DDE-contaminated eggs. The presence of 20 ppb DDE in the water with uncontaminated eggs did not show such reduction in number. It is submitted that sublethal concentrations of DDE in the aquatic environment could have deleterious effects on Chironomidae populations. The relationship of egg viability to pesticide is demonstrated.

72-2196. Foulquier, L.; Reynier, B.; Grauby, A.; Bovard, P. (Commissariat a l' Energie atomique. Departement de protection sanitaire, Section de radioecologie) **Toxicite du lindane sur l' anguille (*Anguilla anguilla* L.) [Toxicity of lindane to eels (*Anguilla anguilla L.*).]** *Compt. Rend. Acad. Agr. France 57(12): 1060-1068; 1971.* (11 references) (French)

The time necessary for appearance of first effects of intoxication (T_1), turn over time (T_2), and 48-hour mean tolerance limits (TLM-48) were determined on eels after addition of different concentrations of lindane (0.2-1.2 mg/l) to aquarium water. The minimum concentration provoking a reaction (Cs) was 0.2 mg/l and the minimum time necessary for reaction at the maximum concentration of compound (1.2 mg/l) was 1-3 min. The TLM-48 was 0.6 mg/l. Young eels (2.5 years old) were more sensitive (55% mortality after 48 hours in the presence of 0.85 mg/l) than older ones (4 years old 15% mortality at the same concentration). Raising the temperature decreased the toxicity: at 11.5°, the TLM-48 was 0.6 mg/l and at 22.5° approx. 1.0 mg/l. It is suggested that this was due to the intense production of mucus by the eels at higher temperature, which fixed or coagulated the toxic substance. A commercial preparation 'Saindane-90' was less toxic than pure lindane: Cs≅0.3 mg/l, Ts≅30 minutes for conc. of 2.0 mg/l, TLM 48-1.1 mg/l compared to 0.6 mg/l for lindane.

72-2197. Catroux, G.; Fournier, J-C. (Laboratoire de Microbiologie des Sols, INRA, 21-Dijon, Cote- d'Or, France). **Microbiologie du sol. Action d'un traitement herbicide a base de *N*-benzoyl-*N*-dichloro-3,4-phenyl)-*N'N'* dimethyluree sur la microflore des sols cultives. [The effects of *N*-benzoyl-*N*-(3,4-dichlorophenyl)-*N'*,*N'*-dimethyl urea on the microflora of cultivated soil.]** *C.R. Acad. Sci. Paris 273(7): 716-718; 1971.* (7 references) (French)

In a first experiment the compound was added in concentrations corresponding to 10 kg/ha (double the recommended dose) to sandy soil poor in organic matter (1.45%) and to limestone soil rich in organic matter (9%). Both soils were maintained at a humidity corresponding to 65% of capacity and temperatures of 15-30°. Bacteria were counted after 5, 15, and 60 days. In a second experiment the microflora of the sandy soil was incubated in the presence of the compound at 0, 10, 30, and 100 mg/l. In a third experiment the microflora of untreated soil poor in organic matter was compared to that of similar soil treated one year previously with 8 kg/ha of the compound. These experiments revealed that even at the highest concentration this compound had no significant effect on the total microflora or on the ammonia forming, nitrifying (nitrate and nitrite forming), amylolytic, and cellulolytic aerobic bacteria. The microflora of the one year previously treated soil did not differ significantly from that of the untreated soil although a slight decrease in the number of nitrifying organisms was noted. It is concluded that as far as the microbiologic activity of soil is concerned, there is no danger in using this compound.

72-2198. Dahlgren, R. B.; Linder, R. L.; Carlson, C. W. (Poultry Res. and Ext., S.Dak. State Univ., Brookings, SD 57006). **Polychlorinated biphenyls: their effects on penned pheasants.** *Environ. Health Perspect. 1: 89-101; 1972.* (25 references)

Toxic effects of polychlorinated biphenyls (PCB's) were studied in penned pheasants. Aroclor 1254 was used in a 1:9 dilution with corn oil and administered as a capsule into the esophagus. The results showed that the rate of egg production among hens receiving 50mg per week was lower than the controls, or the group receiving 12.5 mg each per week of the PCB. Hatchability was highest in controls and lowest in the 50mg group. The chief effects on reproduction occurred through the PCB's ingested by the hen, not by the cock. Behavioral differences were noted in the ability of the pheasants to avoid hand capture, the offspring of parents given PCB being less efficient. Large doses affected appetite. PCB's were rapidly absorbed into the bird's body, stored in the lipid fraction, and excreted slowly in feces and in eggs. In brain tissue, levels of 300-400 ppm were associated with death. Marked splenic atrophy was consistently found in birds that died from PCB administration. Large kidneys and livers were also observed in these birds. PCB's and dieldrin were not synergistic when combined.

72-2199. Peakall, D. B.; Lincer, J. L.; Bloom, S. E. (Section of Ecol. and Systematics, Cornell Univ., Ithaca, NY 14850). **Embryonic mortality and chromosomal alterations caused by Aroclor 1254 in ring doves.** *Environ. Health Perspect. 1: 103-104; 1972.* (8 references)

The breeding success of six pairs of ring doves fed Arclor 1254 (polychlorinated biphenyls) at 10 ppm was observed over two generations. Low hatching of the second generation (4 eggs cf 24) was due to the heavy embryonic mortality, mainly in the age range of 3-8 days. Eggshell thinning was not observed. Cytogenetic studies on dove embryos at 3-6 days of incubation were carried out on PCB-fed doves, on controls, and on one embryo, irradiated with 155 X-rays (positive control). One chromosome rearrangement occurred in a PCB-treated embryo. Thirteen of 17 PCB embryos had aberration rates exceeding the mean control rate, and four PCB embryos exceeded the highest control rate (frequencies of 2.4%, 2.6%, 3.1% and 9.4%). The results were indicative of possible clastogenic (chromosome breaking) action of PCBs. PCB-fed birds, subjected to stress by food reduction, did not differ in response from controls similarly stressed. The occurrence of abnormal young in two species of tern has been reported.

72-2200. Vos, J. G. (Inst. of Vet. Pathol. and Inst. of Vet. Pharmacol. and Toxicol., State Univ. of Utrecht, The Netherlands). **Toxicology of PCB's for mammals and for birds.** *Environ. Health Perspect. 1: 105-117; 1972.* (39 references)

A proper evaluation of toxicity data can be hindered by the possibility that polychlorinated biphenyls (PCB) samples may differ by the presence of impurities in variously produced preparations. Three commercial PCB samples showed a resemblance in gas chromatographic and mass spectra determinations. However, in a comparative feeding test, it was found that 100% mortality with associated organ deterioration only occurred as a result of two of the samples; the third showed only occasional hydropericardium effects. Data presented by different authors are summarized with respect to toxicity effects which include: mortality, liver effects, edema formation, and others. There is some difference of opinion as to the level of toxicity. The possibility of distinguishing between the effects of PCBs and their impurities can be further improved by using pure isomers with known positions of the chlorine atoms. Because of the possible presence of polychlorinated dibenzofurans (PCF) or other toxic impurities in crude PCB preparations, it is suggested that the induction of ALA synthase could be used as a criterion in the evaluation of a no-effect level with PCBs.

72-2201. Norback, D. H.; Allen, J. R. (Dept. of Pathol., Univ. of Wisconsin Med. Sch., Madison, WI 53706). **Chlorinated aromatic hydrocarbon induced modifications of the hepatic endoplasmic reticulum: concentric membrane arrays.** *Environ. Health Perspect. 1: 137-143; 1972.* (26 references)

Sequential biochemical and ultrastructural alterations within the liver produced by three chlorinated aromatic hydrocarbons are described. Separate groups of rats were fed diets containing 1% PCTs (Aroclor 5460), 0.02% PCBs (Aroclor 1254), and 0.002% chlorinated diphenyl-*p*-dioxin. At regular intervals the rats were sacrificed, the livers weighed, and portions removed for electron microscopy. Hypertrophy of the liver of varying degrees was observed in the experimental animals. Ultrastructural changes were limited to the endoplasmic reticulum (ER). The hepatocytes contained numerous multilayered concentric membrane arrays and proliferated smooth ER. These changes, measured after 21 days PCT ingestion, result in increased hepatic function. An increase in microsomal protein per gram of liver was seen following the ingestion of PCTs for 21 days as well as an increase in esterase activity. Enzymatic changes following PCB ingestion were similar to the PCT group. It was conjectured that the enzymatic and compositional changes in the newly formed membrane may prepare the membrane for possible sequestration of metabolites for excretion.

72-2202. Bitman, J.; Cecil, H. C.; Harris, S. J. (U. S. Dept. of Agr., ARS, Beltsville, MD 20705). **Biological effects of polychlorinated biphenyls in rats and quail.** *Environ. Health Perspect. 1: 145-149; 1972.* (9 references)

Biological effects produced by polychlorinated

biphenyls (PCBs) were evaluated in rats and in Japanese quail. Estrogenic activity in immature rats was low. The effects on pentobarbitol metabolism in the quail resulting from the ingestion of PCBs and PCTs elicited diphasic patterns, first inhibiting and then stimulating the induction of greater enzymic activity in the liver. These patterns contrast markedly with those produced by DDT and its analogs. With Aroclor 1242 administration in both male and female rats, there was an increase in liver weight and liver lipids. Also there was a striking decrease of about 50% in the liver concentration and content of vitamin A. Similar effects were seen in the male Japanese quail. Female quails (39 days old), kept in the dark and fed Aroclor 1242 for two months, did not lay eggs and consequently did not mobilize vitamin A for deposition in the egg yolk. There was a reduction of about 50% in liver vitamin A. Upon addition of calcium to the diet, egg production was not suppressed by PCB feeding.

72-2203. Lichtenstein, E. P. (Dept. of Entomol., Univ. of Wisconsin, Madison, WI 53706). **PCBs and interactions with insecticides.** *Environ. Health Perspect. 1: 151-153; 1972.*

The potential effects of plasticizers on biological systems are described, especially in combination with other synthetic chemicals. Polychlorinated biphenyl plasticizers were tested for their toxicological interaction with dieldrin and DDT. Many of these were toxic to *Drosophila melanogaster* Meigen and house flies. The toxicity increased as the chlorine content decreased, dieldrin being the most toxic. The more highly chlorinated and less volatile plasticizers were nontoxic to the insects even at dosages of 2000μg with *D. melanogaster* and 20μg with house flies. Plasticizers alone showed no appreciable effects but significantly increased the toxic effects of dieldrin and DDT. PCB's also increased the toxic effects of DDT with *D. melanogaster.* A substantial increase in the toxicity of organophosphorus insecticides to house flies was achieved with polychlorinated biphenyl plasticizers. Housefly mortalities were increased when these plasticizers were applied one-half hour after the application of the insecticide. The plasticizer inhibited the conversion of parathion to its toxic activation product, paraoxon, and the breakdown of paraoxon into nontoxic compounds.

72-2204. Hoopingarner, R.; Samuel, A.; Krause, D. (Dept. of Entomol., Michigan State Univ., East Lansing, MI 48823). **Polychlorinated biphenyl interactions with tissue culture cells.** *Environ. Health Perspect. 1: 155-158; 1972.* (12 references)

The effects of polychlorinated biphenyls (PCBs) (mixed with DDE) were studied in Chinese hamster cells (quasi-diploid epithelial cells CH-461) and in primary human lymphocytes (with PCB mixtures). Growth suppression of Chinese hamster cells was effected with a mixture of PCBs and DDT. The PCBs were obtained from the Monsanto Company and were analyzed by gas chromatography with detection by a hydrogen flame ionization detector. There was a steady drop in cell numbers with a decrease in percentage of chlorine. PCBs seemed to have no effect on human chromosomes when lymphocytes were treated with Aroclor 1254 at 100 ppm for the first 24 hours and again during the last 8 of a 52-hour period.

72-2205. Cutkomp, L. K.; Yap, H. H.; Desaiah, D.; Koch, R. B. (Dept. of Entomol., Fish. and Wildl., Univ. of Minnesota, St. Paul, MN 55101). **The sensitivity of fish ATPases to polychlorinated biphenyls.** *Environ. Health Perspect. 1: 165-168; 1972.* (11 references)

In vitro and *in vivo* effects of PCBs on the adenosine triphosphatase (ATPase) enzyme system are described. Tissues from bluegill fish were processed to obtain a resultant fraction containing mitochondrial and nerve ending particles. Activity was determined in oligomycin-sensitive (mitochondrial) and oligomycin-insensitive (present in endoplasmic reticulum and plasma membrane) ATPases. The PCBs tested *in vitro* were most effective as inhibitors of oligomycin-insensitive Mg^{2+}ATPase, particularly from muscle homogenates. The oligomycin-sensitive Mg^{2+} ATPase was less affected by PCBs combined with the DDT compounds. Effects are presented in kidneys, brain, and liver. The *in vivo* studies were conducted with fathead minnows which were chronically exposed to Aroclor 1242 and 1254 for four months following hatching. A maximum inhibition in treated fish (Aroclor 1242) *in vivo* was 75% on mitochondrial Mg^{2+}ATPase and 35% on Na^{+}-K^{+}ATPase. Results from brain tissues showed more consistent inhibitory effects than did other tissues.

72-2206. Kinter, W. B.; Merkens, L. S.; Janicki, R. H.; Guarino, A. M.* (Bldg. 10, Rm. 6N119, Nat. Cancer Inst., Bethesda, MD 20014). **Studies on the mechanism of toxicity of DDT and polychlorinated biphenyls (PCBs): disruption of osmoregulation in marine fish.** *Environ. Health Perspect. 1: 169-173; 1972.* (12 references)

Effects of DDT and polychlorinated biphenyls (PCBs) on osmoregulation were studied in the eel and killifish. Plasma milliosmolarity (freezing point depression) and Na^{+} and K^{+} (flame photometer) were determined. Gill homogenates were assayed for Na,K-ATPase activity. Ability to osmoregulate was followed in individual eels placed in 15°C sea water containing 0.1% ethanol and 1 ppm DDT, a level which is fatal by 10 hr. At six hr plasma milliosmolarity in DDT-treated fish had increased about 30% compared with ethanol controls; plasma Na and K had also increased. Additional experiments with ^{14}C-DDT showed that the fish had taken up about half the radioactivity by six hr and that Na,K-

ATPase activity was significantly inhibited (38%) by 50 ppm DDT. Lethal levels of Aroclor 1221 and DDT equally decreased the ability of killifish to osmoregulate. It is suggested that the lipophilic compounds (DDT and PCBs) interact with the phospholipid-activating component of the lipoprotein enzyme.

72-2207. Keil, J. E.; Graber, C. D.; Priester, L. E.; Sandifer, S. H. (Preventive Med. Sect., Med. Univ. of S. Carolina, 80 Barre St., Charleston, SC 29401). **Polychlorinated biphenyls (Aroclor 1242): effects of uptake on *E. coli* growth.** *Environ. Health Perspect. 1: 175-177; 1972.* (11 references)

The effects of polychlorinated biphenyls were studied *in vitro* on *E. coli*, a facultative organism common to human intestinal flora and a prime indicator of fecal contamination. After a 24-hr incubation period on tripticase soy broth (TSB) in which the *E. coli* were treated with two levels of PCBs, the contents were reduced by centrifugation to a pellet which was weighed and assayed for PCBs, nucleic acids, and tritiated uridine uptake (tested in another series). Another series of experiments, designed to confirm stimulation patterns, measured lyophilized harvest weights only. Tritiated uridine uptake was determined at five and eight hr after incubation; RNA and DNA were evaluated. Concentrations up to 1000 ppm of PCBs impregnated into filter paper failed to inhibit *E. coli* growth on TSB agar. The addition of 0.1 and .1 μg/ml PCBs and TSB markedly stimulated growth above control levels. There was no difference between treatments in DNA and RNA after 24 hr incubation. After five hr incubation, there was a significant diminution of ^{3}H-uridine uptake in PCB-dosed bacteria. The results indicated that PCBs stimulate *in vitro* growth of *E. coli*.

72-2208. Tombergs, H. P. (Author address not given). **The PCB situation in Germany.** *Environ. Health Perspect. 1: 179-180; 1972.*

Because the presence of polychlorinated biphenyls (PCBs) in human milk (0.103 ppm) indicating 3.5 ppm in milk fat and 5.7 ppm in human fat tissue was observed in Germany in 1970, investigations were conducted on rats. The studies were concerned with absorption and distribution of PCBs in different organs after one inhalation exposure to Pydroul A 200 (a mixture of low chlorinated biphenyls). After 15 min of exposure the concentration in the liver was more than half of the maximum concentration obtained after 2 hr (70 μg/g tissue). After 30 min the concentration in fat was 14 μg/g, and 9 μg/g in brain tissues. In the course of two days after exposure brain and liver concentrations fell to a minimum with a maximum value being observed in fat (260 μg/g tissue), which remained at a constant level. After intraperitoneal injection of PCBs, a stimulation of the microsomal enzyme systems was observed. Because these enzymes also metabolize adrenal hormones, an effect on reproductive and adrenal hormones can be expected. Toxic effects on liver function are reported.

72-2209. Fessenden, R. J.; Calvert, R. F.; Armson, K. A. (Faculty of Forestry, Univ. of Toronto, Toronto, Ont., Canada). **Effect of some fertilizers and simazine on the activity of the micro-organisms in jack pine humus.** *Forest. Chron. 47(4): 227-228; 1971.* (2 references)

Effects of the addition of the herbicides, 2,4-D and simazine, upon humus microorganism microbial activity were investigated with carbon dioxide evolution used as an index. Humus samples were collected from a jack pine cutover in northeastern Ontario and stored moist at 5° for three months before use. A marked temporary increase of CO_2 evolution resulted from the addition of urea as measured in the laboratory by NaOH absorption of CO_2. Approximately one half of this increase may be ascribed to CO_2 evolved from the chemical decomposition of urea itself, but the remainder reflects the oxidation of 1.5 mg of organic carbon per gram of humus. This quantity of carbon would be solubilized by increasing the pH to 6.6. It was inferred that the increased rate of CO_2 evolution reflected the increased activities of the additional substrates.

72-2210. Knapp, F. W.; Drudge, J. H.; Lyons, E. T. (Agr. Exp. Sta., Univ. of Kentucky, Lexington, KY 40506). **Evaluation of safety and anthelmintic activity of topically applied dichlorvos to calves.** *J. Econ. Entomol. 65(3): 925-927; 1972.* (9 references)

To examine the possibility of using dichlorvos for simultaneous cattle grub and helminth control, Hereford calves weighing 350-400 lb were treated with pour-on applications of 1% dichlorvos in oil at various times throughout the year. Calculated dosages ranged from 6.0 to 12.0 mg/kg; however, subsequent analysis of the dichlorvos preparations used showed that only 24-50% of the original dichlorvos activity was still present in the preparations at the time of use. Calves treated with ca. 2 mg/kg (corrected) in April to June showed toxic manifestations ranging from mild symptoms such as excessive salivation and labored breathing to transient limb stiffness and convulsions. Constant, low-volume urination for 3-5hr after treatment and profuse diarrhea with straining to defecate for 2-3 hr after treatment were seen in all animals. Calves treated with 2-3 mg/kg in late June and July showed no toxic symptoms, whereas calves treated with 2-6 mg/kg in Aug.-Dec. manifested intoxication. All animals recovered in 4-5 hr without treatment. Blood cholinesterase activity, measured in 2 calves, was inhibited by 30-40% within 20-150 hr after treatment with dichlorvos at ca. 2 mg/kg. No significant reduction in the number of helminth eggs per gram of feces was recorded, and treated animals still showed the presence of cattle grubs.

72-2211. Anonymous. **Fish ponds and their health hazards.** *Nutr. Rev. 28(6): 155-158; 1970.*

Fish farming in the tropics presents a number of health hazards which are discussed. Standing water in hot climates may lead to mosquito breeding; these are vectors of malaria, filariasis, and other diseases. The ingress of human excreta into these ponds leads to the spreading of schistosomiasis. Methods of control were described in order to control mosquito breeding; a high spreading oil containing BHC was tested. The formulation and method of application using rice husks soaked with oil and insecticides gave the best control (96.3%), but was found toxic to the fish. The high spreading oil with 0.5% BHC dispensed from a pump gave a control of 83.6% and did not affect the fish. Agricide was also tested, but was found toxic to the fish when used alone and ineffective in controlling mosquito breeding when diluted. Although some fish feed on mosquito larvae, this control failed with two types tested. Other techniques for control include preventive measures: well constructed ponds, proper food for the fish, and proper harvesting.

72-2212. Richard, G. (Author address not given) **Specialites phytosanitaires et exigences toxicologiques. [Plant pesticides and toxicologic requirements.]** *Phytoma 24(238): 37-40; 1972.* (French)

Rules and regulations for guaranteeing the safety of agricultural pesticides are presented. Before being permitted on the market, new products must undergo two types of rigorous testing and be accompanied by an agronomic dossier (proving selectivity and efficacy of the compound) and a toxicologic dossier. The latter is composed of: studies on LD50 of a single oral dose in different animals; percutaneous toxicity; toxicity when inhaled; short term (3 months) studies on toxicity of different dosages with intensive investigation of a number of biochemical parameters; study of long term toxicity (2 years) after daily administration of a "no effect level" dose established in the short term study, and statistical analysis of results; study of 6 generations of animals (usually rats) as to fertility and teratogenic effects; study of carcinogenic effects (which, if present, are conducted over a number of successive generations); effects on bees and game birds; and study of residues, establishing the daily acceptable dose and fixing tolerance limits.

72-2213. Stefaniak, B. (Zaklad Farmakologii i Toksykologii, Instytut Weterynarii, Pulawy, Poland). **Toksykodynamika chlorku chlorocholiny (CCC). Wplyw malych i podostrych dawek na szczury. [The dynamics of toxicity of chlorcholine chloride (CCC). Effects of small and subacute doses on rats.]** *Pol. Arch. Wet. 14(1): 117-126; 1971.* (18 references) (Polish)

In the 1st experiment, oral (in food) administration of chlormequat chloride CCC (30 mg/kg/day = 1/16 LD50) for eight weeks to one-month-old rats had no deleterious effect on growth and development of these animals. Unexpectedly, a statistically significant greater weight gain, most noticeable after two weeks of feeding, was observed in the experimental group when compared to controls. Except for acetylcholinesterase of the RBC, which was higher in the experimental animals, all other biochemical indices (plasma and brain cholinesterase, blood glucose, liver glycogen, cholesterol in plasma and adrenals, ascorbic acid in testis and adrenals, hemoglobin, RBC, WBC) showed no significant deviation from controls. In the 2nd experiment, a single intragastric administration of 240 mg/kg (½ LD50) of CCC to three months old rats caused transient symptoms of intoxication (lasting 2-3 hours after administration) and changes in several biochemical indices which were measured at 0, 1, 4, and 24 hrs of experiment. Most pronounced were: a decrease in plasma cholinesterase activity (in females), decrease in adrenal weight, increase in adrenal cholesterol and ascorbic acid, decrease in plasma potassium, increase in plasma sodium, decrease in hemoglobin and leukocytes. Most changes were more pronounced in females and showed a tendency towards normalization after 24 hours.

72-2214. Reiter, L.; Talens, G.; Woolley, D. (Dept. of Environ. Toxicol. and Dept. of Anim. Physiol., Univ. of California, Davis, CA 95616). **Effects of parathion administration on single-trial learning and on brain cholinesterase activity in mice.** *Proc. West. Pharmacol. Soc. 15: 123-126; 1972.* (5 references)

Neurological deficiencies reported in workers frequently exposed to organophosphate insecticides have prompted the experimental work related to parathion administration in animals. Effects of parathion administration on passive avoidance learning in mice is presented. Associated with the behavioral tests, blood and brain levels of cholinesterase and AChE activities were also determined. The maximum effect of parathion on learning, after oral administration of a dose of 6 mg/kg, occurred within the first hour after ingestion. AChE and ChE activities in both blood and brain were significantly inhibited after parathion, with the maximum effect at 30 min.

72-2215. Greve, P. A.; Verschuuren, H. G. (Rijksinstituut voor de Volksgezondheit, Bilthoven, The Netherlands). **Die Toxizitaet von Endosulfan fuer Fische in Oberflaechengewaessern. [The toxicity of endosulfan to fish in surface waters.]** *Schriftenr. Ver. Wasser-Boden- Lufthyg. 34: 63-67; 1971.* (German)

Results of biological tests aimed at answering the question, "How much endosulfan can be permitted in surface waters while preventing damage to the ecosystem?" are presented. The LC50 of endosulfan in pure water in aquaria after 48-hr exposure is 2.40 ppb for the

guppy, 1.40 ppb for the roach (fish), and 3.05 ppm for the carp. The LC50 values initially found were too high. This was prior to the discovery that endosulfan is readily adsorbed on glassware, especially greasy glassware, although cleaning the utensils with chromic acid reduces this adsorption. When 1% of river sediment was added to the aquaria, the LC50 of endosulfan rose to 3.7 ppb for the guppy, and to 8 ppb for the roach. The addition of 0.1% sodium chloride to water containing endosulfan plus 0.1% sediment showed that salinity decreases the adsorption of endosulfan by sediment; surprisingly, salt also increases the toxicity of endosulfan. From a value of 2.40 ppb in the absence of sodium chloride, the LC50 of endosulfan drops to 1.20 ppm for the guppy in water containing 0.1% salt and to 0.53 in the presence of 0.8% salt. Detergent addition also enhances endosulfan toxicity: the LC50 for the guppy drops from 2.40 ppb in plain distilled water to 0.87 ppb in water containing tetrapropylenebenzenesulfonate.

72-2216. Herbst, H. V. (Landesanstalt fuer Gewaesserkunde und Gewaesserschutz Nordrhein/Westfalen, 415 Krefeld-Huelserberg, Germany). **Untersuchungen zur Toxizitaet von Endosulfan auf Fische und wirbellose Tiere. [Studies on the toxicity of endosulfan to fish and invertebrates.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. 34: 69-75; 1971.* (1 reference) (German)

Preliminary experiments on the toxicity of endosulfan to two species of fish, *Leucaspius delineatus* and *Gobio gobio* (gudgeon) primarily indicated the wide variation in results which can be caused by extraneous factors such as temperature changes, variations in the general condition of the fish, and composition of the test water. A series of symptoms representing a range of damage to the fish was established. Symptoms ranged from slight excitation with elevated respiratory rate through increasing excitation, including a tendency to jump out of the water, paralysis, and death. The critical limiting concentration of endosulfan for *L. delineatus* appeared to be 5 ppb; above this concentration, almost 100% of the fish died within 72 hr. Endosulfan was clearly more toxic to fish maintained in water from the Rhine than to fish maintained in tap water, and to tapeworm-infested fish as opposed to healthy fish. The damage produced in fish whose symptoms had progressed beyond excitation to disturbances of equilibrium was apparently irreversible. Even after transfer to clean water, such fish died after about 24 hr. Gudgeons were somewhat more sensitive to endosulfan than *L. delineatus*, but invertebrates in general were more resistant, some tolerating up to 600 ppb for three days.

72-2217. Barber, T. A.; Nagy, J. G. (Dept. of Fish. and Wildl. Biol., Colorado State Univ., Fort Collins, CO). **Effects of pesticides on mule deer rumen bacteria.** *Trans. N. Amer. Wild. Nat. Resour. Conf., 153-162; 1971.* (14 references)

In vitro effects of fungicides, insecticides, and herbicides on the rumen microflora of mule deer (*Odocoileus hemionus*) are presented. Effects of pesticides on growth of deer rumen bacteria (in both pure and mixed cultures), on the decomposition of cellulose, and on the production of volatile fatty acids were investigated. Pure cultures of rumen bacteria proved more sensitive to inhibition by pesticides than did mixed cultures. Proteolytic organisms isolated from casein-containing solid media were sensitive to the majority of tested compounds at levels of 100 ppm. Cellulolysis by mixed cultures of mule deer rumen bacteria proved the most sensitive of bacterial function examined. Volatile fatty acid production was affected adversely by a number of pesticides tested. Of the three compounds that were consistently inhibitory toward bacterial growth, only one was a herbicide, 2,4-D, the other two contained antibacterial metallic elements. Organophosphates and DDT were inhibitory only at very high concentrations. High levels of field pesticide application would probably be necessary to affect *in vivo* rumen function, but, as indicated from the *in vitro* work, that amount exceeds an acute toxic dose for the animal. Suggestions for *in vivo* work with penned pesticide-fed deer are offered.

72-2218. Quick, H. L. (11 West Steger Road, Steger, IL 60475). **Clinical evaluation of a free-hanging 20% dichlorvos (DDVP) disc for control of flea infestation of dogs.** *Vet. Med Small Anim. Clin. 66(8): 773-774; 1971.*

Dichlorvos discs (containing 20% DDVP) were tested in dogs in four geographic areas of the United States. Each disc was enclosed in a plastic container with ventilation holes for the escape of DDVP vapors. At the end of 96 hours, 80% of the previously flea-infested dogs were free of parasites, and the control animals without the DDVP discs began to be infested. At the end of 120 hours, all the test dogs were free of fleas. There were no observable clinical changes due to the pesticide and the BUN, hemoglobin, and WBC values remained unchanged. Cholinesterase activity was low in some of the larger animals, but not to an alarming degree. It was observed that dogs not exposed to DDVP showed wide variations in cholinesterase activity. As a precautionary measure, DDVP treatment should not be applied when the cholinesterase activity in the animal is low.

72-2219. Maksimovic, M.; Vojvodic, V. (Author address not given). **Pripreme mesavine PAM-2C1 i holinolitika za parenteralnu upotrebu i stabilnost oksima u vodenim rastvorima. [Preparation of a mixture of PAM-2C1 (pyridine 2-aldoxime methyl chloride) and a cholinolytic for parenteral use and the stability of the oxime in aqueous solution.]** *Vojnosanit. Pregled 29(3): 117-119; 1972.* (16 references) (Croatian)

Two antidote mixtures, used parenterally in

treating intoxication with organophosphorus compounds (insecticides, nerve gases, drugs, etc.), were prepared and tested for their ip toxicity in male mice. These mixtures consisted of 1.0 g pyridine 2-aldoxime methyl chloride (PAM-2Cl pralidoxime) + 0.002 g atropine sulfate + 0.003 g benzactisine hydrochloride and 1.0 g PAM-2Cl + 0.01 g benzactisine hydrochloride. Sterilization of these antidote mixtures at 120°C and freeze-drying caused a very small loss of the oxime (5%). Mixtures of pralidoxime and cholinolytic agents prepared in this way were slightly more toxic than the original preparations. About 5% of PAM-2Cl was lost after standing at 20°C for 8 months in aqueous solution and less than 9% was lost at 40°C; however, PAM-2Cl was almost completely decomposed after standing at 80° for 40 days. *N,N'*-Trimethylene-bis-pyridine-4-aldoxime chloride (TMB-4Cl) was more stable than PAM-2Cl in aqueous solution.

72-2220. Engst, R.; Schnaak, W.; Lewerenz, H.-J. (Zentralinstitut fuer Ernaehruhg, Deut. Akademie der Wissenschaften, Berlin, DDR). **Untersuchungen zum Metabolismus der fungiciden Aethylen-bis-dithiocarbamate Maneb, Zineb und Nabam. V. Mitteilung. Zur Toxikologie der Abbauprodukte. [Studies on the metabolism of the fungicidal ethylene-bis-dithiocarbamates maneb, zineb and nabam. Part V. Toxicology of the degradation products.]** *Z. Lebensm. Unters. Forsch. 146(2): 91-97; 1971.* (13 references) (German)

The toxicity of dithiocarbamate degradation products was studied *in vitro* and *in vivo*. For the *in vitro* tests, the sulfhydryl enzyme urease and peroxidase—not regarded as a typical sulfhydryl enzyme—were incubated with pure preparations of maneb, zineb, and nabam and their degradation products: ethylene-bis-thiuram disulfide (ETD), ethylene-bis-thiuram monosulfide (ETM), ethylene-bis-thiourea (ETU), and ethylene-bis-diisothiocyanate (mustard oil). The marked (40%) inhibition of urease by mustard oil at low concentrations (10^{-6} mol/l.) was noteworthy. At higher concentrations, the intact dithiocarbamates display greater inhibitory effects on both enzymes than the degradation products (approaching 100% at 10^{-3} mol/l.). *In vivo* tests in rats and mice were performed with the intact dithiocarbamates as well as various fractions of the reaction mixtures containing degradation products. The fraction rich in ETM was more toxic (LD50 in mouse, 580 mg/kg body weight; in rat, 1570 mg/kg) than the active principles. The degradation fractions containing primarily inorganic sulfur compounds and ETU were less toxic. In subacute experiments, the serum LDH, GOT, GPT, and ADH activities were reduced in comparison to the control; thyroid, kidney, adrenal, and testicle weights were generally increased. No indications of damage to organs were evident.

72-2221. Orpin, C. G.; Knight, M.; Evans, W. C. (Dept. of Biochem. and Soil Sci., Univ. Coll. of North Wales, Bangor, Caerns, U. K.). **The bacterial oxidation of picolinamide, a photolytic product of diquat.** *Biochem. J. 127(5): 819-831; 1972.* (34 references)

The pathway of oxidation of picolinamide (pyridine-2-carboxamide) by a Gram-negative rod has been elucidated. Under conditions of high pH, restricted aeration and high substrate concentration, whole cells released 2,5-dihydroxypyridine into culture supernatants. Sodium arsenite at 5 m*M* caused whole cells to accumulate 6-hydroxypicolinate, and at 1 m*M*, pyruvate, in culture media. Whole cells oxidized picolinamide, picolinate, 6-hydroxypicolinate, maleamate and maleate without lag. Cell-free extracts converted picolinamide into picolinate, and hydroxylated picolinate to 6-hydroxypicolinate. The hydroxylase was particulate, but could be solubilized by ultrasonic treatment; it required NAD^+ for activity, and did not require molecular oxygen. 2,5-Dihydroxypyridine was converted into maleamate and formate by an oxygenase requiring GSH and Fe^{2+}. Maleamate was deamidated to maleate, and maleate isomerized to fumarate, by unsupplemented extracts. (Author abstract by permission)

72-2222. Orpin, C. G.; Knight, M.; Evans, W. C. (Dept. of Biochem. and Soil Sci., Univ. Coll. of North Wales, Bangor, Caerns, U.K.). **The bacterial oxidation of *N*-methylisonicotinate, a photolytic product of paraquat.** *Biochem. J. 127(5): 833-844; 1972.* (30 references)

Two bacteria have been isolated that are capable of oxidizing *N*-methylisonicotinate, a photodegradation product of Paraquat (1,1'-dimethyl-4,4'-bipyridylium ion). *N*-Methyl-isonicotinate-grown cells of strain 4C1, a Gram-positive rod, oxidized 2-hydroxy-*N*-methylisonicotinate without lag. Cell-free extracts of these cells converted 2-hydroxy-isonicotinate into 2,6-dihydroxyisonicotinate; the reaction did not require molecular oxygen. Maleamate was deamidated and maleate isomerized to fumarate by soluble enzyme systesm. [^{14}C]Formaldehyde was isolated as the dimedone derivative from the supernatant of a cell suspension oxidizing *N*[^{14}C]methylisonicotinate, and no [^{14}C]-methylamine was detected. Whole cells incubated with *N*-methyl[*carboxy*-^{14}C]isonicotinate released 95% of the radioactivity as $^{14}CO_2$. The second bacterium, strain 4C2, a Gram-negative rod, did not oxidize any of the mono- or di-hydroxypyridines or their *N*-methyl derivatives that were available or could be synthesized; nor did cell-free extracts oxidize any of these compounds. Methylamine was oxidized by whole cells without lag; cell-free extracts converted methylamine into formaldehyde when a soluble enzyme system requiring an electron acceptor was used; formaldehyde was oxidized to formate and formate to CO_2 by enzyme systems requiring NAD^+. (Author abstract by permission)

72-2223. Wright, K. A.; Cain, R. B. (Microbiology Group, Dept. of Botany, Univ. of Newcastle upon Tyne, Newcastle upon Tyne, U.K.). **Microbial metabolism of pyridinium compounds. Metabolism of 4-carboxy-1-methyl-pyridinium chloride, a photolytic product of paraquat.** *Biochem. J. 128(3): 543-559; 1972.* (48 references)

A bacterium, *Achromobacter* D, isolated from garden soil by elective culture, utilized *N*-methylisonicotinic acid (4-carboxy-1-methylpyridinium chloride) as sole carbon source. Extracts of *N*-methylisonicotinate-grown cells oxidized this substrate only after supplementation with a source of nicotinamide nucleotides and then consumed 1 mol of O_2 and released 1 mol of CO_2/mol of *N*-methylisonicotinate supplied. The *N*-methyl group of the substrate was released as methylamine whereas the five C atoms of the pyridine ring were accounted for as succinate and formate. The CO_2 evolved by extracts was believed to derive from the carboxyl group on C-4 of the heterocyclic ring. The immediate precursor of the succinate end-product was succinic semialdehyde; the inducible nature of succinic semialdehyde dehydrogenase in *N*-methylisonicotinate-grown cells supported this finding. There was no evidence for monohydroxylation of the ring, but the time sequence of the appearance of the end-products indicated that the oxygen-requiring, NADH-requiring and decarboxylation steps clearly preceded the formation of methylamine and succinate. The results are consistent with the oxidative cleavage of a partially reduced heterocyclic ring followed by several hydrolytic and dehydrogenase steps resulting in the appearance of the end-products. (Author abstract by permission)

72-2224. Wright, K. A.; Cain, R. B. (Microbiol. Group, Dept. of Botany, Univ. of Newcastle upon Tyne, Newcastle upon Tyne, NE1 7 RU, U.K.). **Microbial metabolism of pyridinium compounds. Radioisotope studies of the metabolic fate of 4-carboxy-1-methylpyridinium chloride.** *Biochem. J. 128(3): 561-568; 1972.* (17 references)

Extracts of *Achromobacter* D formed CO_2, methylamine, succinate and formate as metabolic end-products from *N*-methylisonicotinic acid (4-carboxy-1-methylpyridinium chloride). The origin of the CO_2 in the 4-carboxyl group and of the methylamine in the *N*-methyl group of *N*-methylisonicotinate was demonstrated with *carboxyl*-^{14}C- and *N-Me*-^{14}C-labelled substrates respectively. The carbon skeletons of formate and succinate were shown to arise from the C-2 and the C-3-C-6 atoms of the heterocyclic ring respectively by using *N*-methyl[2,3-$^{14}C_2$]isonicotinate. This result is consistent with ring cleavage by the organism between C-2 and C-3. (Author abstract by permission)

72-2225. Hassan, A. (Perrine Primate Res. Branch, Div. of Pestic. Chem. and Toxicol. FDA, Perrine, FL 33157). **Pharmacological effects of carbaryl–I. The effect of carbaryl on the synthesis and degradation of catecholamines in the rat.** *Biochem. Pharmacol. 20(9): 2299-2308; 1971.* (17 references)

The pharmacological effects of 1-naphthyl *N*-methylcarbamate (carbaryl) in the rat were investigated with respect to catecholamine metabolism. Animals fed 700 ppm of carbaryl eliminated significantly higher amounts of urinary 3-methoxy-4-hydroxymandelic acid (VMA) as compared to control rats (over 300 per cent after 1 month). VMA excretion was maximal at about 30 days and then decreased, approaching normal values after 195 days. Dietary carbaryl fed at 100 ppm did not affect VMA excretion during 7 months of administration. A single oral carbaryl dose of 50 or 80 mg/kg resulted in a significant increase of urinary VMA, and the excretion of the corresponding alcohol, 3-methoxy-4-hydroxyphenylglycol (MHPG), also increased, but to a much lesser extent. Increased VMA excretion was also observed in adrenalectomized and hypophysectomized rats treated with carbaryl. Results showed a significant increase (68 per cent) in the turnover rate of norepinephrine (NE) in hearts from carbaryl-treated rats over that obtained in normal animals; but there was no change in the steady state concentration of the transmitter. It is suggested that the increase in synthesis rate of NE (and probably also the increased VMA excretion) is the result of increased sympatho-adrenergic activity, and that the adrenal medulla is not involved to any appreciable extent. The mechanism leading to increased nerve activity is presently unknown. Carbaryl strongly stimulated the pituitary-adrenocortical axis, as indicated by an increased corticosterone level in the plasma. (Author abstract by permission)

72-2226. Iqbal, Z. M.; Menzer, R. E. (Dept. of Entomol. Univ. of Maryland, College Park, MD 20742). **Metabolism of *O*-ethyl *S,S*-dipropyl phosphorodithioate in rats and liver microsomal systems.** *Biochem. Pharmacol. 21(11): 1569-1584; 1972.* (23 references)

After administration of *O*-ethyl-^{14}C and S,S-dipropyl-^{14}C-labeled *O*-ethyl S,S-dipropyl phosphorodithioate (Mocap, prophos) to rats, chloroform-extractable radioactivity was recovered from the urine only from rats treated with the propyl-^{14}C-labeled compound. It contained traces of methyl propyl sulfide, methyl propyl sulfoxide, and methyl propyl sulfone, products of S-methylation and subsequent oxidation of the propyl thiolate ion released from *O*-ethyl S,S-dipropyl phosphorodithioate. The major water-soluble metabolite isolated from rat urine, liver microsomes and supernatant was *O*-ethyl S-propyl phosphothioic acid. Rat urine also contained *O*-ethyl phosphoric acid, S-propyl phosphorothiolic acid and S,S-dipropyl phosphorodithioic acid. Rat and rabbit liver supernatant enzymes were able to *O*-de-ethylate *O*-ethyl S,S-dipropyl phosphorodithioate in the presence of reduced glutathione. S-ethylglutathione-ethyl-^{14}C was produced when

the supernatant preparations were incubated with *O*-ethyl-^{14}C S,S-dipropyl phosphorodithioate, indicating that glutathione acted as an ethyl acceptor. (Author abstract by permission)

72-2227. Mendoza, C. E.; Shields, J. B.; Phillips, W. E. J. (Res. Labs., Food and Drug Dir., Ottawa, Ontario, Canada). **Distribution of carboxylesterase activities in different tissues of albino rats.** *Comp. Biochem. Physiol. 40B: 841-854; 1971.* (10 references)

Esterase activities on indophenyl acetate were determined in extracts of livers, kidneys, brain, thigh muscles and testes of albino rats. Livers and kidneys had higher esterase activity than brain, muscles or testes. No significant loss of esterase activities was observed when the tissues were left untouched in the body 1-24 hr after decapitation. Analysis of tissues from the same liver on 5 successive days or at 1- to 60-day intervals were reproducible. The method was also used to demonstrate esterase activities in tissues of DDT-fed rats and progeny and in necropsy samples of human livers. Esterase activities in rat livers were significantly enhanced by the feeding of diets containing 20 ppm DDT for 3.5-4 mo. However, the esterase activities in tissues of progeny suckling the milk of DDT-fed dams did not differ from those of controls. (Author abstract by permission, supplemented)

72-2228. Dvorchik, B. H.; Maren, T. H. (Dept. of Pharmacol. and Therapeutics, Univ. of Florida Coll. of Med., Gainesville, FL). **The fate of *p,p'*-DDT [2,2-bis(*p*-chlorophenyl)-1,1,1-trichloroethane] in the dogfish, *Squalus acanthias*.** *Comp. Biochem. Physiol. 42A(1A): 205-211; 1972.* (11 references)

Ring labeled ^{14}C-*p,p'*-DDT was administered via the caudal vein or artery or by stomach tube to *Squalus acanthias*; tissue distribution and excretion of total radioactivity was followed with time. The liver, which contains about 60 per cent lipid, was found to sequester the drug quantitatively. No radioactivity was found in the gill effluate or urine over a 48-hr period. The drug appears to be well absorbed from the gastrointestinal tract of the dogfish. Preliminary studies indicate that the drug may be bound to and transported by the plasma lipoproteins. Preliminary studies also showed that there is a marked toxicity, of a delayed type, following injection of 5 mg/kg of *p,p'*-DDT. (Author abstract by permission)

72-2229. Wells, M. R. (Mississippi State Univ., State Coll., MS). **The *in vivo* and *in vitro* binding of endrin, aldrin and DDT to liver and brain particulate fractions of insecticide-resistant and susceptible mosquitofish (*Gambusia affinis*).** *Diss. Abstr. Int. 32(4): 2374-B; 1972.*

Susceptible mosquitofish from State College, Mississippi and resistant mosquitofish from the Mississippi Delta were assayed for endrin, aldrin and DDT binding to particulate fractions of livers and brains following *in vivo* and *in vitro* treatment. Livers and brains were homogenized and particulate fractions separated by differential centrifugation. Mitochondria from livers and brains as well as myelin were treated directly with pesticide to determine binding. Pellets resulting from differential centrifugation were identified by electron microscopy. The *in vivo* studies based on protein indicate a significant difference between susceptible and resistant fish brains in the uptake of endrin, aldrin and DDT and point to a membrane barrier. The *in vivo* studies also indicate a more effective blood-brain barrier (two fold) in resistant fish to endrin, aldrin and DDT. There was a difference in total distribution of endrin and DDT within the brains, specifically within the cell membranes and mitochondria. It appears that the cell membranes of resistant fish retain endrin and DDT, thus reducing the amount entering the cell. The opposite effect is seen in the mitochondrial membrane as the pesticide was prevented from entering rather than being retained. A different pattern was noted for aldrin, in which there is an apparent reduction in the conversion of aldrin to dieldrin in resistant fish. Relatively pure myelin fractions showed less binding of pesticide in all resistant myelin fractions. This indicates a structural difference in myelin in resistant fish. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 71-27,029.)

72-2230. Manley, G. V. (Michigan State Univ., E. Lansing, MI). **Macro-arthropod cryptozoan predators: DDT metabolism and food chain studies.** *Diss. Abstr. Int. 32(4): 3418-B; 1972.*

o,p'-DDT, *p,p'*-DDT and *p,p'*-DDE were introduced directly into the invertebrate food chain by feeding to laboratory reared DDT-resistant *Collembola* at the rate of 100,000 parts per million in their food before they were released into experimental field plots. Each of the materials acted differently. Significant amounts of DDT were metabolized into DDE. In fact, some of the most efficient arthropod forms were able to convert virtually all of the ingested DDT to DDE within a few hours. *o,p'*-DDT degradation appears to occur through formation of *p,p'*-DDT, from which *p,p'*-DDE is formed. Due to the absence of *p,p'*-DDT evidence on the GLC trace, some arthropods appear to metabolize *o,p'*-DDT directly to *p,p'*-DDE. As suggested by the speed at which some arthropods can convert *p,p'*-DDT to *p,p'* DDE however, detectable levels of *p,p'* DDT are apparently never reached. Movement of the pesticide in the food chain was very rapid and encompassing. Within a period of twelve hours, the pesticide had moved to virtually all of the arthropods in the plots. *p,p'*-DDE appears to be the most stable isomer in the environment. When *p,p'*-DDE was introduced into the plots, the arthropods accumulated large amounts, larger than either

o,p'- or *p,p'*-DDT. No conversion products or metabolites of *p,p'*-DDE were identified by the GLC analysis. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 71-31-,258).

72-2231. Uzoukwu, M.; Sleight, S. D. (Dept. of Pathol., Michigan State Univ., East Lansing, MI 48823). **Effects of dieldrin in pregnant sows.** *J. Am. Vet. Med. Assoc. 1160(12): 1641-1643; 1972.* (8 references)

The effects of dieldrin in pregnant sows during the last 30 days of gestation were studied. Multiple oral doses of dieldrin were given to assess transplacental passage of dieldrin, its accumulation in maternal and fetal tissues, potential fetal toxicosis, and potential clinical signs and lesions. Sodium nitrite, in addition to dieldrin, was given to 2 of the sows during a 28-day period. Dieldrin crossed the placenta, but concentrations in fetal liver and brain were considerably less than in samples from maternal tissues. Mild degenerative lesions were in the liver and kidneys of sows but not in the fetuses. Abortions or fetal deaths did not occur in sows given dieldrin or dieldrin and nitrite. (Author abstract by permission)

72-2232. Johnson, Jr., J. C.; Bowman, M. C.; Leuck, D. B.; Knox, F. E. (Dept. of Anim. Sci., Coastal Plain Sta., Tifton, GA 31794). **Persistence of phosvel in corn silage and effects of feeding dairy cows the treated silage.** *J. Dairy Sci. 54(12): 1840-1847; 1971.* (10 references)

Corn treated in the field with Phosvel [*O*-(4-bromo-2-5-dichlorophenyl) *O*-methyl phenylphosphonothioate] at rates of .0, .56, 1.12, and 2.24 kg/hectare was ensiled 1 day later and subsequently fed to 16 lactating cows (4 per treatment). Silages produced from treated corn and fed during 8 weeks following 62 days from ensiling contained 56 to 66% of the ensiled Phosvel. Ingesting Phosvel and its phenol at averages of .41 to 1.71 mg per kilogram body weight did not affect ($P>.05$) silage dry matter intakes even though blood cholinesterase was measurably, but not critically, lowered ($P<.05$). Cows fed silage from the high treatment had greater body weight gains ($P<.05$) but produced less milk ($P<.05$) than cows fed control silage; thus, Phosvel residues seemed to effect a preferential formation or utilization of nutritive metabolic products or both for synthesizing body tissues rather than milk. Residues of Phosvel were present in milk, feces, and urine of all cows fed treated silage, but the highest mean residues in milk at any sampling were .244±.012 ppm Phosvel and .030±.003 ppm phenol. Except for an average of only .012 ppm Phosvel in milk from cows fed the high residue treatment, the milk, urine, and feces were free of residues within 1 week after feeding of the treated silage was terminated. (Author abstract by permission)

72-2233. Sun, Y. P. (Biol. Sci. Res. Center, Shell Development Co., Modesto, CA 95352). **Correlation of toxicity of insecticides to the house fly and to the mouse.** *J. Econ. Entomol. 65(3): 632-635; 1972.* (6 references)

The correlation between the toxicity of 15 organochlorine (OCI) and 14 organophosphorus (OP) insecticides with and without synergists, to the house fly, *Musca domestica* L., and to the mouse, was determined. The results, plotted on log-log paper, correlate better when fly results were determined in the presence of a synergist than without. The difference in circulatory systems may be responsible for better correlation with the synergist present. When the safety factor was calculated between mouse LD50 and fly LD50, it varied from 0.87 to 56 with a mean of 19.4 for 15 OCI. For 14 analogues of Gardona® (2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate) the safety factor varied from 19 to 1060 with a mean of 376, indicating that this group of vinyl phosphates is safer than OCI. (Author abstract by permission)

72-2234. Hatfield, C. T.; Johansen, P. H. (Dept. of Biol., Queen's Univ., Kingston, Ont., Canada). **Effects of four insecticides on the ability of Atlantic salmon parr (*Salmo salar*) to learn and retain a simple conditioned response.** *J. Fish. Res. Bd. Can. 29(3): 315-321; 1972.* (13 references)

The learning ability of untreated, acetone-treated, and insecticide-treated Atlantic salmon parr was determined in a shuttlebox conditioning apparatus. Learning improvement on second conditioning was also tested. The results were that: (1) acetone did not affect learning; (2) with treatment for 24 hr at the 96-hr LC50 Sumithion (fenitrothion) completely inhibited learning, Abate retarded learning, DDT mildly enhanced learning, and methoxychlor was without a detectable effect; (3) when Abate and methoxychlor-treated salmon in item (2) above were retrained 1 or 7 days later their learning ability improved; but DDT-treated fish showed no improvement; (4) four days of recovery from a 24-hr exposure to the 96-hr LC50 of Abate or Sumithion still resulted in slow learning ability, although after 7 days of recovery learning rate was the same as that of controls; (5) insecticide treatment at the 96-hr LC50 level for 24 hr interposed between first and second conditioning had little or no effect on learning ability; (6) insecticide concentrations at one-tenth the 96-hr LC50 or lower had no effect on learning ability. (Author abstract by permission)

72-2235. Stevens, J. T.; Stitzel, R. E.; McPhillips, J. J. (Dept. of Pharmacol., W.Virginia Univ. Med. Center, Morgantown, WV 26506). **The effects of subacute administration of anticholinesterase insecticides on hepatic microsomal metabolism.** *Life Sci. Part II 11(9): 423-431; 1972.* (13 references)

Subacute administration of parathion, paraoxon,

disulfoton and carbaryl produces a decrease in hexobarbital sleeping time and an increase in the rate of metabolism of hexobarbital and aniline. *In vitro* metabolism of hexobarbital was enhanced to a greater degree than the metabolism of aniline. The doses required to produce these changes in metabolism also cause a significant percentage of deaths. (Author abstract by permission)

72-2236. Webb, R. E.; Randolph, W. C.; Horsfall, F. (Dept. of Biochem. and Nutr., Va. Polytech. Inst. and State Univ., Blackburg, VA 24061). **Hepatic benzpyrene hydroxylase activity in endrin susceptible and resistant pine mice.** *Life Sci. Part II 11(9): 477-483; 1972.* (10 references)

Benzpyrene hydroxylase activity in hepatic microsomes from endrin resistant pine mice was found to be higher than in microsomes from susceptible mice. The hydroxylase activity of resistant offspring was also significantly higher than the parental strain. Pretreatment of resistant mice with dieldrin resulted in a further increase in hydroxylase levels. It was concluded that the data presented offer supportive evidence for a heritable as well as an adaptive aspect of the resistance. (Author abstract by permission)

72-2237. Wustner, D. A.; Desmarchelier, J.; Fukuto, T. R. (Div. of Toxicol. and Physiol., Dept. of Entomol., Univ. of California, Riverside, CA 92502). **Structure for the oxygenated product of peracid oxidation of Dyfonate insecticide (*O*-ethyl-*S*-phenyl ethylphosphonodithioate).** *Life Sci. Part II 11(11): 583-588; 1972.* (14 references)

Reaction of *O*-ethyl *S*-phenyl ethylphosphonodithioate (Dyfonate) with *m*-chloroperbenzoic acid gives phenyl ethoxy(ethyl) phosphinyl disulfide and not the structure proposed by McBain *et al.* (see abstract no. 72-1038). This assignment of structure is based on unambiguous synthesis as well as on interpretation of spectral and chemical evidence. Contrary to the earlier report, this product is probably not an intermediate in enzymatic oxidation of dithionophosphorus compounds in microsomal systems. (Author abstract by permission)

72-2238. Vohland, H. W.; Koransky, W. (Inst. fuer Toxikol. und Pharmakol. der Philipps-Universitaet, Marburg an der Lahn, Germany). **Effect of α-hexachlorocyclohexane on metabolism and excretion of pentetrazole (Cardiazol) in the rat.** *Naunyn-Schmiedebergs Arch. Pharmakol. 273: 99-108; 1972.* (19 references)

α-Hexachlorocyclohexane (αHCH) has been shown to be a potent anticonvulsant when tested with pentetrazol. In the experiments reported here the question was examined whether or not the anticonvulsant properties of α-HCH are based on an acceleration of pentetrazol breakdown in the rat. In this study the rat has been shown to metabolize pentetrazol extensively. The enzymatic activity is located in the microsomal fraction of the liver and requires NADPH and oxygen. It is inhibited by SKF-525 A and carbon monoxide. This is taken as evidence that P-450 containing mixed function oxidases are involved in the breakdown of pentetrazol. α-HCH pretreatment leads to an acceleration of pentetrazol breakdown by microsome preparations of about 140%. *In vivo* α-HCH pretreated rats eliminate pentetrazol from brain and serum with a half life of 1.3 h, while this is 3.8 h in untreated rats. The earliest point in time at which α-HCH pretreatment causes diminished brain levels of pentetrazol has been found 60 min after pentetrazol injection. Prior to this brain levels of pentetrazol were identical in untreated and α-HCH-treated rats. As pentetrazol elicits convulsions within the first 30 min following oral or subcutaneous administration of a convulsive dose and α-HCH is clearly active as an anticonvulsant under these conditions, the accelerated breakdown of pentetrazol cannot be the cause of the anticonvulsive action of α-HCH. (Author abstract by permission)

72-2239. Rehfeld, B. M.; Bradley, Jr., R. L.; Sunde, M. L. (Dept. of Home Econ., Northern Illinois Univ., DeKalb, IL 60115). **The effect of polychlorinated biphenyls on chicks. 3. Recovery.** *Poultry Sci. 51(2): 435-439; 1972.* (5 references)

Symptoms of PCB toxicity in 1-day-old chicks fed dietary levels of 30 and 40 ppm polychlorinated biphenyls (PCBs) (Aroclor 1248) for 2½ wk were reversed or eliminated when a non-contaminated basal diet was fed for 3½ wk. Other 1-day-old chicks fed diets containing 40 and 50 ppm PCBs for 5 wk were unable to gain weight at a normal rate by the 13th wk. The concentration of PCBs which accumulated in adipose tissue and liver when the latter diets were fed returned to normal levels when chicks were fed a non-contaminated ration for 8 wk. Chicks appeared normal when the experiments were terminated. (Author abstract by permission)

72-2240. Rehfeld, B. M.; Bradley, Jr., R. L.; Sunde, M. L. (Dept. of Home Econ., Northern Ill. Univ., DeKalb, IL 60115). **Toxicity studies on polychlorinated biphenyls in the chick. 2. Biochemical effects and accumulations.** *Poultry Sci. 51(2): 488-493; 1972.* (14 references)

Chicks fed polychlorinated biphenyls (PCBs) showed depression in hemoglobin levels and packed cell volume. The quantity and percentage of PCBs which accumulated in adipose tissue and liver fat increased as dietary levels of PCBs increased from 20 to 50 ppm. The ability of the chick to detoxify lower chlorinated PCBs was shown. Concentrations of calcium and magnesium in plasma from chicks fed diets containing up to 150 ppm

PCBs remained unchanged throughout this study. (Author abstract by permission)

72-2241. Richert, E. P.; Prahlad, K. V. (Dept. of Biol. Sci., Northern Ill. Univ., DeKalb, IL 60115). **The effect of the organophosphate *O,O*-diethyl-*S*[(ethylthio) methyl] phosphorodithioate on the chick.** *Poultry Sci. 51(2): 613-619; 1972.* (18 references)

Fertile White Leghorn chicken eggs were injected on the 10th day of incubation with 0, 1.50, or 2.00 ppm Thimet and allowed to hatch. The following parameters were examined: hatchability, incidence of deformities, thyroid weight, thyroid histology, thyroid ^{125}I uptake, and brain cholinesterase activity. As the Thimet dosage was increased, the hatchability decreased, and the incidence of deformities increased. There was a significant increase in thyroid weight in the 2.00 ppm Thimet injected group. The rate of ^{125}I uptake by the thyroid in the treated groups was also significantly different. The histological picture revealed an increase in follicular resorption vacuoles in the treated groups. These results suggest that the Thimet injected chick embryos have hyperthyroid tendencies in the immediate post-hatched life. Although these effects were evident, brain cholinesterase activity was not significantly different among the groups. (Author abstract by permission)

72-2242. Daigneault, E. A. (Dept. of Pharmacol., Louisiana State Univ. Med. Center, New Orleans, LA 70112). **Correlation of prolonged insecticide exposure and the activity of the inhibition of cochlea NI potential.** *Toxicol. Appl. Pharmacol. 21(4): 495-502; 1972.* (8 references)

This study was initiated after observing blocked responses of round window cochlea N_1 potential (nerve activity evoked from the cochlea by a short click) to cholinergic drugs in cats maintained for extended periods of time in the vivarium. Cats were maintained in a clean environment until a stable population was obtained. A randomly selected group was used for the control study of cochlea activity by monitoring the round window potential. The effectiveness of the efferent nervous system and intraarterial acetylcholine injections, and the influence of efferent nerve section were determined. Insecticide treatment was instituted to study whether correlative losses would occur as insecticide concentrations increased. At intervals of 9, 15, 34, and 42 wk a randomly selected group was tested. After 42 wk, in 83% of the animals the N_1 potential was no longer depressed by intraarterial acetylcholine, and a 50% block of olivocochlear bundle stimulation occurred. These results correlated with the data from tissues analyses for DDT in renal lipid samples. In those animals responsive to acetylcholine in the 34- and 42-wk groups enhanced depression of N_1 occurred. Sectioning of the innervation produced no change in the acetylcholine activity, indicating that the activity produced by the drug is at a peripheral site. The results obtained from acutely administered insecticide experiments indicate that the agents most active as depressants of N_1 and potentiators of acetylcholine are DDT and the potent cholinesterase inhibitors (paraoxon, diazinon).

72-2243. Villeneuve, D. C.; Willes, R. F.; Lacroix, J. B.; Phillips, W. E. J. (Res. Labs., Food and Drug Dir. Dept. of National Health and Welfare, Ottawa, Canada). **Placental transfer of ^{14}C-parathion administered intravenously to sheep.** *Toxicol. Appl. Pharmacol. 21(4): 542-548; 1972.* (12 references)

^{14}C-Parathion was administered iv once to pregnant, conscious sheep, 90-110 days of gestation, at a rate of 0.1 mg/kg body weight. Samples of maternal and fetal blood as well as amnionic fluid were taken by means of chronically implanted cannulas. Plasma cholinesterase was decreased by approximately 50% in the mother and 25% in the fetus. Total radioactivity in the blood and amnionic fluid were monitored over a 48-hr period and decay profiles established. Placental transfer of parathion was confirmed by thin-layer chromatography. (Author abstract by permission)

72-2244. Vos, J. G.; de Roij, T. (Inst. of Vet. Pathol. Utrecht, The Netherlands). **Immunosuppressive activity of a polychlorinated biphenyl preparation on the humoral immune response in guinea pigs.** *Toxicol. Appl. Pharmacol. 21(4): 549-555; 1972.* (21 references)

Three groups of 12 female albino guinea pigs were fed 0, 10, and 50 ppm Aroclor 1260 (PCB) for 8 wk. In half of the animals a function test of the immunological system was carried out: tetanus toxoid injection was used to study the humoral response. At the end of the experiment cellulose acetate electrophoresis was used to determine the serum proteins, including the γ-globulin level. The number of γ-globulin-containing cells in popliteal lymph nodes was determined semiquantitatively with the direct fluorescent antibody technique. Both these techniques seemed to be sensitive parameters for the immunosuppressive action of PCB in the tetanus toxoid-stimulated animals. In the unstimulated guinea pigs no suppressive activity could be found. Other parameters, such as leukocyte counts, weights of thymus, spleen and lymph nodes and number of follicles and pyroninophilic cells, were in general not sensitive enough to detect an effect of PCB feeding. Absence of effects on weight and histomorphology of thymus and adrenal gland indicated that not stress but PCB itself was responsible for the immunosuppressive activity. (Author abstract by permission)

72-2245. Eastin, E. F. (Dept. of Soil and Crop Sci., Texas A & M Univ., College Station, TX 77843). **Fate of fluorodifen in susceptible cucumber seedlings.** *Weed Sci. 20(3): 255-260; 1972.* (9 references)

Rapid absorption and acropetal translocation of ^{14}C from *p*-nitrophenyl-*α,α,α*-trifluoro-2-nitro-*p*-tolyl ether (fluorodifen) labeled with ^{14}C at either the 1 position of the *p*-nitrophenyl ring (fluorodifen-1′-^{14}C) or the trifluoromethyl carbon (fluorodifen-$^{14}CF_3$) were observed in cucumber (*Cucumis sativus* L. 'Ashley') seedlings after root treatment via nutrient solution. The major degradative products of fluorodifen-1′-^{14}C were *p*-nitrophenol and Unknown I (possibly a conjugate of *p*-nitrophenol). Some *p*-nitrophenyl-*α,α,α*-trifluoro-2-amino-*p*-tolyl ether (2-amino-fluorodifen), *p*-aminophenyl-*α,α,α*-trifluoro-2-amino-*p*-tolyl ether (*p*,2-diamino-fluorodifen), *p*-aminophenyl-*α,α,α*-trifluoro-2-nitro-*p*-tolyl ether (*p*-amino-fluorodifen), and several minor unknowns also were detected. The major degradative product of fluorodifen-$^{14}CF_3$ was Unknown II (possibly a conjugate of 2-amino-4-trifluoromethylphenol). Also detected were some 2-amino-fluorodifen, 2-amino-4-trifluoromethylphenol, *p*-amino-fluorodifen, *p*,2-diamino-fluorodifen, 2-nitro-4-trifluoromethylphenol, and several minor unknowns. The basic difference in susceptibility to fluorodifen of cucumber and peanut (*Arachis hypogaea* L. 'Starr') appears to be due to the rate of acropetal translocation (cucumber translocates more than peanut) and the rate of degradation (peanut degrades fluorodifen much more rapidly than cucumber). (Author abstract by permission)

See also **72-2046** **72-2055** **72-2072** **72-2100** **72-2103** **72-2110** **72-2111** **72-2112** **72-2117** **72-2120** **72-2124** **72-2127**

72-2246. Chiu, Y. C.; Tripathi, R. K.; O'Brien, R. D. (Sect. Neurobiol. and Behavior, Cornell Univ., Ithaca, NY 14850). **A gel-scanning method for kinetic studies on an acetylcholinesterase isozyme.** *Anal. Biochem. 45(2): 480-487; 1972.* (21 references)

Procedures and kinetic parameters obtained from a bovine erythrocyte acetylcholinesterase isozyme were developed using a modification of the Davis gel electrophoresis method. This modification was introduced in order to extend the methods for quantitative studies on gels, after automated gel scanning, so that kinetic constants could be established for various substrates and inhibitors. After electrophoresis, the gels were equilibrated in the respective incubation buffer medium. For kinetics of catalysis, two gels each were transferred into various concentrations of substrate medium and shaken with α-naphthyl acetate or with acetylthiocholine. For inhibition studies, two gels each were incubated with the desired concentration of inhibitor. Inhibition was terminated by transferring the gels into the substrate medium for color development. The enzymic reaction was stopped by dipping the gels into 7% acetic acid for fixation. The colors of the zymogram remained stable for hours. The kinetics of inhibitions with Tetram and malaoxon demonstrated that the inhibition rate displayed first-order kinetics with identical *ki* values from both substrates. Values of *Km* were increased and of *ki* decreased when the enzyme in the gel was compared with that in solution. In addition, kinetics of several different forms of isozyme could be resolved from a single zymogram.

72-2247. Baker, P. B.; Flaherty, B. (Dept. of Trade and Ind., Lab. of the Govt. Chemist, Cornwall House, London, SE1 9NQ, England). **Fungicide residues Part I. The detection, identification and determination of residues of quintozene in tomatoes, lettuces and bananas by gas chromatography.** *Analyst 97(1154): 378-382; 1972.* (12 references)

A simple method for determining residues of quintozene (PCNB) in tomatoes, lettuces, and bananas is presented. After extraction with hexane, quintozene is separated from interfering co-extractives by a partition process with dimethylformamide followed by chromatography on an alumina column, and is quantitatively determined by electron-capture gas-liquid chromatography. A confirmatory chemical test for quintozene is also described. (Author abstract by permission)

72-2248. Gruebner, P. (Pflanzenschutzamt beim Rat fuer Landwirtschaftliche Produktion und Naehrungsgeuterwirtschaft des Bezirkes Dresden, 8019 Dresden, DDR). **Semiquantitative, duennschichtchromatographische Bestimmung von DNOC-und DNBP-Rueckstaenden in Pflanze und Boden. [Semiquantitative thin-layer chromatographic determination of DNOC and DNBP residues in plants and soil.]** *Arch. Pflanzenschutz 7(4): 309-314; 1971.* (6 references) (German)

DNOC and DNBP (dinoseb) can be determined simultaneously or individually in plants and soil with semiquantitative accuracy. Although extraction with sodium hydroxide or bicarbonate is feasible, extraction of samples with ethanol is preferred to avoid gel formation. After evaporation of the alcohol, the aqueous residue is acidified then extracted with *n*-hexane. The organic phase is dried, the solvent evaporated, and the residue built up to a selected volume with acetone. An aliquot of the residue is chromatographed on a silica-gel thin-layer plate. Preferred solvent systems are acetone/*n*-hexane 2/1 (DNOC *Rf* 0.26; DNBP 0.57; impurities 0.70-0.95) or benzene/methanol/glacial acetic acid 95/4.75/0.25 (DNOC *Rf* 0.56; DNBP 0.71; impurities 0.80-0.90). If the inherent yellow color of the nitro compounds is used as the indicator, detection of 0.1 μg is possible; fluorescence quenching under UV permits detection of 0.5 μg; treatment with stannous chloride/*p*-dimethylaminobenzaldehyde spray reagents (a more time-consuming procedure) permits detection of 0.01 μg. Recovery values for both substances from vegetables were 90-100%, and from soil, 100-120%.

72-2249. Schoene, K. (Institut fuer Aerobiologie, D5949 Grafschaft von Hochsauerland, Germany). **"Titration" of acetylcholinesterase with soman.** *Biochem. Pharmacol. 20(9): 2527-2529; 1971.* (7 references)

An improved method for estimating the number of active sites in acetylcholinesterase (AChE) preparations is simpler and more rapid than previous ones. It is based on the measurement of the enzyme activity of AChE after partial inhibition by the phosphonylating agent soman. Two of the four stereoisomers of soman react very rapidly with AChE whereas the other two are relatively poor inhibitors; the same is true of chymotrypsin. Therefore, the concentration of soman in the stock solutions was determined via the inhibition of a chymotrypsin preparation of known activity. A measured quantity of the soman stock solution (known activity) was then added to a given amount of AChE and the activity measured at various times by performing pH-stat titrations with acetylcholine as substrate. Activity decreased to a constant level within the first 5 min. Comparison with the original activity (as determined in control runs with 1% ethanol instead of soman) yielded the percentage of AChE inhibited. Secondary studies indicated that the fast inhibition of AChE is due to the same pair of soman stereoisomers as is the inhibition of chymotrypsin. The slow-reacting soman enantiomers remaining in the reaction mixture after inhibition of AChE by the fast-reacting isomers do not interfere with the action of oxime reactivators such as TMB-4.

72-2250. Ochynski, J. (Katedra Chemii Toksykologicznej i Sadowej, A M Lublin, Poland). **Oznaczenie sklad-**

nikow preparatu "Insektozol" w materiale biologicznym. [Determination of "Insektozol" components in biological material.] *Bromat. Chem. Toksykol. 4(2): 199-206; 1971.* (32 references) (Polish)

Separation, identification and quantitative determination of *p,p'*-DDT and HEOD (dieldrin) (active components of "Insektozol" insecticide) in organs of rats after po administration of "Insektozol" is described in detail. The compounds were separated by thin-layer chromatography. Using aluminum oxide, the *Rf* values were 0.66-0.68 for *p,p'*-DDT, 0.18-0.19 for HEOD. The values were somewhat lower using silica gel. Using cellulose, the *Rf* values were 0.27-0.31 and 0.43-0.46 respectively. For quantitative determination of *p,p'*-DDT in organ extract, the Schechter-Haller method was used, and for HEOD the Bergman and Sanik method was used. Statistical evaluation revealed that with these methods approximately 90% recovery of *p,p'*-DDT and 88% recovery of HEOD was achieved. Twenty-four hours after intragastric administration of an "Insectozol" dose corresponding to 40 mg/kg *p,p'*-DDT and 10 mg/kg HEOD, the following amounts were found in 1 g of tissue: *p,p'*-DDT: 108.6 μg/g liver; 656.8 μg/g intestinal tract; HEOD: 37.6 μg and 151.2 μg respectively.

72-2251. Berg, O. W.; Diosady, P. L.; Rees, G. A. V. (Ontario Water Resour. Comm., 135 St. Clair Ave. W., Toronto, Ont., Canada). **Column chromatographic separation of polychlorinated biphenyls from chlorinated hydrocarbon pesticides, and their subsequent gas chromatographic quantitation in terms of derivatives.** *Bull. Environ. Contam. Toxicol. 7(6): 338-347; 1972.* (17 references)

A column chromatographic technique for the separation of polychlorinated biphenyls (PCBs) from organochlorine pesticides is described. The technique is based on the use of activated charcoal for the adsorption of the pesticides. The DDT group can be eluted from the charcoal column with an ether-acetone mixture, the PCBs may be recovered later with benzene. The recoveries of pesticides, using this method, were 90% or better. Experimental trials have indicated that PCBs can be converted quantitatively into bicyclohexyl or to decachlorobiphenyl. Under suitable conditions, the PCBs can be dechlorinated quantitatively with hydrogen over Pt or Pd catalysts, using 5% aqueous solutions of chloroplatinic acid or palladium chloride. Treatment of PCBs with antimony pentachloride under elevated temperatures and anhydrous conditions gives very good yields of decachlorbiphenyl. Both macro- and micro-synthesis for PCB perchlorination are described.

72-2252. Murano, A.; Fujiwara, S.; Kosaka, T. (Takarazuka Res. Lab., Sumitomo Chem. Ind. Co. Ltd., Takarazuki-shi, Japan). **[Analytical studies on pesticides and related compounds XIX. Gas chromatographic determination of optically active allethrin and phthalthrin.]** *Bunseki Kagaku (Jap. Anal.) 21(7): 890-897; 1972.* (14 references) (Japanese)

Because of the recent industrial exploitation of *d-trans*-isomers of chrysanthemates, which have stronger insecticidal activity than other isomers, it has become necessary to develop a method for determining the *d-trans*-isomers. The total quantities of allethrin and phthalthrin and various optical isomers were determined on a gas chromatograph with a hydrogen flame ionization detector. For allethrin, Chromosorb W coated with LAC-2R-446 (7%) or DEGS (5%) in a glass column (1 m long, 3 mm i.d.), operated at temperatures of 195 or 180°C respectively, and using β-naphthoquinone as the internal standard gave the best results. It was necessary to operate at higher temperatures in the case of phthalthrin because of its lower vapor pressure. For determination of the isomers, both allethrin and phthalthrin were hydrolyzed by heating in 1 *N* methanolic potassium hydroxide under reflux for 30 min. to form chrysanthemic acid, and the acid was esterified with *l*-menthol to form diastereoisomeric esters. The esters were successively separated by GLC on a long column of QF-1 fortified with 1-3% sodium borate. A sample of technical allethrin, 92% purity, contained 92.5% of the *d-trans* isomer, 1.1% *l*-trans, and 6.4% *d*- and *l-cis*-isomers.

72-2253. Mosinska, K.; Kotarski, A. (Instytut Przemyslu Organicznego, Warsaw, Poland). **Oznaczenie Herbicydu DNPP i 2,4-Dwunitrofenolu w preparatach chwastobojczych i technicznym DNPP za pomoca chromatografii cienkowarswowej i polarografii. [Determination of DNPP and DNP in herbicide preparations and in technical DNPP by thin layer chromatography and polarography.]** *Chemia Analityczna 17(2): 327-332; 1972.* (7 references) (Polish)

Quantitative determination of DNPP (2-isopropyl-4,6-dinitrophenol) and DNP (2,4-D) by polarography (polarograph PO 4- Radiometer) after prior separation from impurities by thin-layer chromatography is described. The samples were dissolved in acetone with glacial acetic acid (4:1 vol/vol) in such a manner as to contain approximately 0.0025 g DNPP/cm^3. The solution was chromatographed on silica gel up to a height of 18 cm using a benzene-methanol mixture (97+3 vol/vol) as the mobile phase. DNPP gave an *Rf* value of 0.80, DNP 0.57. The spots were colorful and did not need to be developed. Polarography was next performed in the presence of adsorbent after addition of 50% acetate buffer (pH 5.4) and 50% ethanol (2.5 cm^3 each). Results were compared to a standard curve. The following half wave potential values were obtained: E½ DNPP = -0.27 V (1st wave), and -0.69 V (2nd wave); E½DNP = -0.33 V (1st wave), and -0.72 V (2nd wave). The relative standard deviations were ± 0.04 for DNPP and ± 0.1 for DNP.

72-2254. Cook, W. J. (Div. Chem. Technol., U.S. Food and Drug Admin., BF-420, 200 C St., S.W., Washington, DC 20204). **Some chemical aspects of polychlorinated biphenyls (PCBs).** *Environ. Health Perspect. 1 : 3-13; 1972.* (9 references)

Many of the chemical aspects of polychlorinated biphenyls (PCBs) and methods of study are presented. In the investigation of the properties of PCBs data must be interpreted with caution, especially chemical analysis by gas chromatography. Since chlorination is possible at a number of sites on the biphenyl rings, there are a few molecules of every possible structure present in each product. Only the predominant ones exist in high enough concentrations to give detector responses. The parameters of operating an electron-capture detector also influence the responses (e.g. voltage). Microcoulometry and electrolytic conductivity are more specific for halogen-containing compounds. Also, PCBs are subject to changes by microorganisms, in animal systems, by light, and in plant systems. Discussion also covers man's exposure to residues of PCBs in his food and how it occurs directly into food; transfer to food from paperboard; in animal food (into tissues); in fish; and into the environment. Capsule histories are given.

72-2255. Ristow, R. (Institut fuer Tieraerztliche Nahrungsmittelkunde, 63 Giessen, Germany). **Nachweis und Bestimmung von Rueckstaenden eines chlorierten Kohlenwasserstoffes (Brommethylhexachlorbicycloheptен). [Detection and determination of residues of a chlorinated hydrocarbon (bromomethylhexachloronorbornene).]** *Fleischwirtschaft 52(5): 597-602; 1972.* (15 references) (German)

Although bromomethylhexachloronorbornene (bromocyclen) is used for the control of ectoparasites and grain beetles in poultry husbandry, no information on residues in treated fowl is available, nor has an analytical method for these residues been described previously. The method developed here begins with extraction according to the AOAC method; i.e., grinding the samples with sand, dissolution of fat in petroleum ether, and extraction of insecticide with acetonitrile. The acetonitrile solution is diluted with water, again extracted with petroleum ether, and the petroleum ether solution cleaned up on a Florisil column. Recovery of added substance with this method was 100%. Gas chromatography using a column packed with SE30 silicone rubber on Chromosorb G and an electron-capture detector gave good separation of bromocyclen from other pesticides and impurities. Although bromocyclen retention time was 4.2 min., a total operating time of up to 40 min was required to elute all other insecticides and impurities present. Optimal thin-layer chromatographic separation was obtained on silica gel impregnated with 1% silver nitrate and with chloroform:hexane 9:1 as developer. Visualization by spraying with silver nitrate-perhydrolphenoxyethanol reagent, followed by intensive irradiation with UV for 15-20 min permitted detection of as little as 0.1-0.5 μg of bromocyclen.

72-2256. Ernst, W. (Institut fur Meeresforschung, 285 Bremerhaven, Handelshafen 12, German Federal Republic). **Degradation of [^{14}C] DDT on Silica Gel G chromatograms under laboratory conditions.** *J. Chromatogr. 67(1): 179-181; 1972.* (6 references)

Metabolic studies of purified DDT were carried out to determine the nature of photodegradation products under various light intensities. Thin-layer chromatography of [^{14}C] DDT on Silica Gel G and Silica Gel GF254 gave rise to the formation of polar substances. The most effective light source was shortwave UV light, even after 15-min. periods, as used in the detection of four components. Studies by the more sensitive method of radioscanning led to the conclusion that silica gel chromatographic techniques are not conclusive with this compound unless appropriate precautions are taken to guard the labeled DDT against exposure to light, and repeated purification is carried out before the study is undertaken.

72-2257. Albro, P. W.; Fishbein, L. (Nat. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **Quantitative and qualitative analysis of polychlorinated biphenyls by gas-liquid chromatography and flame ionization detection.** *J. Chromatogr. 69(2): 273-283; 1972.* (17 references)

Retention indices on six liquid phases are given for the mono-, di- and trichlorobiphenyls, and the additivity of half-retention index values in predicting retention indices is confirmed for these compounds. A method is given for predicting the relative molar response of the hydrogen flame ionization detector to polychlorinated biphenyls for which no pure standard is available. Solute-solvent interactions between these "non-polar" compounds and a variety of liquid phases are discussed.

72-2258. Vyboh, P.; Michalek, M.; Mrva, B.; Ungvarsky, C. (Res. Inst. of Agrochem. Technol., Bratislava, Czechoslovakia). **Quantitative determination of the methyl ester of 2-chloro-3-(4-chlorophenyl)propionic acid in technical products and formulations by gas chromatography.** *J. Chromatogr. 69(2): 305-310; 1972.* (16 references)

A method is described for the quantitative determination of the methyl ester of 2-chloro-3-(4-chlorophenyl)propionic acid (common name chlorphenpropmethyl), the active ingredient of herbicide formulations known under the trade-name Bidisin. The method is proposed for the determination of both technical and formulated products. On a poly neopentyl glycol succinate-phosphoric acid column it is possible to determine also the following by-products: free 2-chloro-3-(4-chlorophenyl)propionic acid, its nitrile and its amide,

and other impurities derived from raw materials and other reactions as well, either simultaneously or after modification of the operating conditions. The conditions for the qualitative analysis of the methyl ester of 2-chloro-3-(4-chlorophenyl)propionic acid samples and for the qualitative and quantitative analyses of the nitrile of 2-chloro-3-(4-chlorophenyl)propionic acid (a by-product from the preparation of the methyl ester) are described. (Author abstract by permission)

72-2259. Greenhalgh, R.; Cochrane, W. P. (Chem. and Biol. Res. Inst., Res. Branch, Canada Dept. of Agr., Ottawa, K1A 0C6, Canada). **Comparative gas chromatographic response of organophosphorus compounds containing nitrogen and nitrogen compounds with alkali flame and electrolytic conductivity detectors.** *J. Chromatogr. 70(1): 37-44; 1972.* (15 references)

Both the alkali flame detector and the electrolytic conductivity detector can be used for the gas chromatographic determination of nitrogen compounds. While the electrolytic conductivity detector is specific, the alkali flame detector responds to various hetero atoms. The response for a series of organonitrogen and organophosphorus compounds containing other hetero atoms were determined under the same experimental conditions, and the results were compared. The response of the alkali flame detector is greater for phosphorus than for nitrogen and the results obtained suggest that the magnitude of response is dependent on structural effects. In the absence of phosphorus, compounds containing only nitrogen showed no obvious structural correlation. With the electrolyte conductivity detector the response is purely a function of the amount of nitrogen in the molecule. The responses of these two detectors to nitrogen compounds were of the same order. (Author abstract by permission)

72-2260. McClure, V. E. (Nat. Oceanic and Atmos. Admin., Nat. Marine Fish Serv., Southwest Fisheries Center, La Jolla, CA 92037). **Precisely deactivated adsorbents applied to the separation of chlorinated hydrocarbons.** *J. Chromatogr. 70(1): 168-170; 1972.* (2 references)

Partial deactivation of silica gel or alumina column adsorbents used for the separation of chlorinated hydrocarbons from interfering biological materials prior to gas chromatography is necessary in order to obtain smooth, reproducible adsorption and elution. A precisely controllable deactivation method has been developed; this applies to adsorbents usually deactivated with water and involves the equilibration of the activated adsorbent with a solution of a strongly adsorbed material in an appropriate solvent. Alumina is activated at 400°C for 4 hr or more, then equilibrated with a 1% methanol-in-benzene solution; the required quantity of solution can be determined graphically. Good results have been obtained with a column containing this material in the cleanup of lipid samples extracted from fish and plankton with acetone-hexane. Separation of DDE and the PCB component which interferes in GLC assay can be performed on a column containing silica gel activated at 180°C then equilibrated with a solution of 0.5% diethyl ether in benzene. PCBs are eluted from such a column with a small volume of *n*-hexane. DDT and its metabolites are eluted with a small volume of the 0.5% diethyl ether in benzene solution. After a hexane rinse, the column is ready for reuse, thus facilitating comparison of results for standard and unknown solutions.

72-2261. Pojda, S. M. (Katedra Farmakologii AM, Katowice, Poland). **Mikrometoda manometryczna oznaczania aktywnosci esterazy acetylcholinowej. [Determination of acetylcholinesterase activity by the micromanometric method.]** *Klin. Oczna 42(1a): 507-508; 1972.* (2 references) (Polish)

A micromanometric adaptation (using Braun's micromanometers) of the Warburg macromanometric method for the determination of acetylcholinesterase activity in small amounts of brain and ocular tissue is described in detail. A 1-5% concentration of tissue homogenates is optimal, but experiments can also be conducted with 0.1-0.5% concentrations. The optimal final concentration of acetylcholine is $5 \times 10^{-3} M$; higher concentrations inhibit esterase activity. The AChE activity in human ocular (iris) tissue was 1.0-6 μl CO_2/mg/10 min. The activity was strongly reduced or absent in tissue (iris) from patients who had previously received local applications of physostigmine.

72-2262. Welti, D.; Sissons, D. (Unilever Res. Lab., Colworth House, Sharnbrook, Bedford, England). **The proton chemical shifts of polychlorinated biphenyls.** *Org. Magn. Resonance 4(2): 309-319; 1972.* (16 references)

Methods used in the structural identification and characterization of individual polychlorinated biphenyls include gas chromatography, mass spectrometry, and nuclear magnetic resonance spectrometry. Chemical shift values and approximate coupling constants have now been obtained for many polychlorinated biphenyls using a 220 MHz spectrometer, and are presented along with simulated spectra of the compounds. The chemical shift values are affected by at least three factors: the influence of the chlorine atoms at *o*-, *m*-, or *p*-position in relation to the proton under examination; the effect of Cl atoms substituted in the 2 and 6 positions of one ring on the protons in the 2 and 6 positions of the other ring; and the electronic effect of chlorine atoms at various positions on the biphenyl bridge. Substitution in the *ortho* position weakens the C-C bridging bond, whereas substitution in the other positions increases the strength of the bond and the coplanarity of the rings. The data provided by such investigations, though not always sufficient for unequivocal identification of a compound,

may provide indications which can be used in conjunction with predicted gas chromatographic retention indices to select the most likely structure.

72-2263. Kazmierczak, T. (Poznan, Poland). **Problemy analityczne pozostalosci pestycydow w zywnosci. [Analytic problems of pesticide residues in food.]** *Przem. Spozy. 26(3): 103-107; 1972.* (Polish)

A discussion is presented of methods of analysis, equipment and organization of laboratories, collecting of samples, representativeness of samples, and certification of products. Shortage and difficulty in acquisition of equipment and reagents leads to a great variety of improvisations and modifications of analytical methods in Poland. The need for standardization, manufacture of necessary equipment in Poland rather than importing from abroad, establishment of large, central regional laboratories with better utilization of available equipment and work force is stressed. The difficulties in collecting representative samples for analysis are discussed as well as a need for devising a better system of collecting which would be fair to producer and buyer. Certification of non-homogeneous products originating from (in Poland predominating) "extensive" (as opposed to "intensive") production methods is more difficult since the average content of residue may differ several-fold in different samples. The required number of samples to be analyzed should depend on: evaluation of different risk factors as opposed to expense; extent of contamination; percentage of samples exceeding tolerance limits; type of calculation, i.e., results obtained as averages from a certain number of samples or some other form based on statistical calculation; establishment of variance factor and standard deviation.

72-2264. Sieper, H. (E. Merck AG, Abt. Pflanzenschutz, 61 Darmstadt, Germany). **Bestimmung und Abbau von Dithianon, Pyridinitrilund Flurenol in Boeden und Gewaessern. [Determination and degradation of dithianon, pyridinitrile and flurenol in soil and water.]** *Schriftenr. Ver. Wasser- Boden- Lufthyg. 34: 109-115; 1971.* (10 references) (German)

According to current German laws, a pesticide manufacturer must submit data on the residue behavior of his products not only in the treated crops, but also in soil and water. Analytical methods were developed for determining aqueous concentrations of three new pesticides: dithianon, a fungicide; pyridinitrile (2,6-dichloro-4-phenyl pyridine-3,5-dicarbonitrile), also a fungicide; and flurenol, a plant growth regulator. All of these compounds were extracted from water with dichlomethane, and the concentrated extracts cleaned-up by TLC. The pesticide was eluted from the silica gel scratched from the TLC spots with methylene chloride. Dithianon was then colorimetrically determined by reaction with morpholine, giving an absorption maximum at 510 nm. Pyridinitrile gave a readable color reaction with an absorption maximum at 585 nm when treated with a buffered solution of pyridine and barbituric acid. Spectrophotometry of flurenol required several preliminary steps: alkaline hydrolysis; decarboxylation; oxidation to fluorenone; and condensation with *p*-nitrophenylhydrazine to form the hydrazone, which gave an absorbance maximum at 597 nm under alkaline conditions. Degradation studies in soil and water revealed that the half-life of the compounds in eutrophic water is 1-4 days. In a slightly acidic sandy loam, the compounds do not leach readily. The half-life of dithianon in this soil was 18 days, the flurenol esters, 1.5 days.

72-2265. Lavy, T. L.; Messersmith, C. G.; Knoche, H. W. (Dept. of Agron., Univ. of Nebraska, Lincoln, NB 68503). **Direct liquid scintillation radioassay of [^{14}C]-labeled herbicides in soil.** *Weed Sci. 20(3): 215-219; 1972.* (8 references)

A liquid scintillation counting solution was developed which optimized the direct assay efficiencies of ^{14}C-labeled 2-chloro-4-(ethylamino)-6-(isopropylamino)-*s*-triazine (atrazine), 3,6-dichloro-*o*-anisic acid (dicamba), and *a,a,a*-trifluoro-2,6-dinitro-*N,N*-dipropyl-*p*-toluidine (trifluralin) in soil. In this counting technique, 3-g soil samples containing [^{14}C]-labeled herbicide were placed directly into a liquid scintillation vial containing a phosphorescent counting solution. Samples were shaken and allowed to settle before assaying using a liquid scintillation spectrometer. This direct radioassay was as efficient or more efficient than double or single extraction processes. Automatic external standardization in conjunction with the liquid scintillation counter was an effective tool for estimating the [^{14}C] present in soil samples. (Author abstract by permission)

72-2266. Goll, K. H.; Gartzke, J. (Medizinisch-Diagnostisches Institut "Unter den Linden", Berlin, Germany). **Duennschichtchromatographischer Nachweis von Cholinesterase. [Thin-layer chromatographic detection of cholinesterase.]** *Z. Klin. Chem. Klin. Biochem. 9(3): 213-214; 1971.* (21 references) (German)

The hydrolysis of acetylcholine by serum cholinesterase can be followed via the acetic acid or the choline liberated, or by the decrease in acetylcholine concentration in a reaction mixture. Choline and acetylcholine can easily be separated by thin-layer chromatography. In the present method, 0.1 ml of serum is incubated with 0.2 ml of a 50 m*M* acetylcholine chloride-buffer solution for 10 min at 37°C. The reaction is then stopped with 0.2 ml of a 17 m*M* physostigmine solution. Then 20 µl of the mixture is pipetted onto alumina TLC plates and developed with benzene:ether:methanol 40:20:40. Better separation can be attained using Cellulose MN-300 plates and the developer system *n*-butanol: water:formic acid 60:35:15; however, the required developing time is longer. The plates are air-dried and sprayed with Dragendorff reagent or with 0.2% dipicryl-

amine in 50% aqueous acetone. Quantitative evaluation is performed using a densitometer with a blue filter. A blank, in which physostigmine is added to the substrate-buffer solution before the serum, is also measured to eliminate any error due to non-enzymatic hydrolysis. Comparison of the densitometric values gives the substrate conversion, expressed in percent or converted to units/l. of substrate conversion in μmol/min·l.

72-2267. Seifert, J.; Davidek, J. (Institut fuer Lebensmittelchemie der Chemisch-Technologischen Hochschule, Prague, Czechoslovakia). **Enzymatische Bestimmung von Organophosphat-Insecticiden mittels polarographischer Analyse. [Enzymatic determination of organophosphate insecticides by polarographic analysis.]** *Z. Lebensm. Unter. Forsch. 146(1): 17-21; 1971.* (13 references) (German)

Organophosphate insecticides (OPI) can be determined on the basis of the inhibition of serum esterase activity, indicated polarographically. Polarographic methods have the advantages of speed and simplicity of the actual determination, relatively great sensitivity, and minimal requirements with respect to sample preparation and cleanup. Esterases are obtained by diluting 1 ml of human blood serum with 50 ml distilled water. The procedure for setting up an enzyme inhibition curve by this method is as follows: To 1 ml of OPI solution, after evaporating the solvent with a nitrogen stream, is added 3 ml phosphate buffer (pH 6.8) and 1 ml enzyme preparation. After incubation for 60 min at 37°C, 1 ml of β-naphthyl acetate solution is added, then the mixture is incubated for another 60 min. Two ml of 0.2 *M* sulfuric acid and 1 ml of 3 *M* sodium nitrate are added, the mixture shaken, and built up to 25 ml with 2*M* sodium acetate. After removal of oxygen from the solution with nitrogen, polarography is performed from +0.10 V to -0.4 V against the saturated calomel electrode. The activity (i.e., height of polarographic wave) found is calculated as a percentage of the activity without OPI added. Graphs of the inhibition percentages versus known OPI concentration can be used for determining the OPI concentration of unknown samples.

See also 72-2067 72-2105 72-2108 72-2109 72-2111 72-2114 72-2115 72-2129 72-2138 72-2209

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